

Identifying and Teaching English Collocations for Persian Students

By

Maryam Barghamadi

Bachelor of Midwifery, Postgraduate of Teaching English

Thesis

*Submitted to Flinders University
for the degree of*

Doctor of Philosophy

College of Nursing and Health Sciences

August 2024

Supervisor Team

Associate Professor Amanda Müller (Principal Supervisor)

College of Nursing and Health Sciences, Flinders University, Australia

Professor Joanne Arciuli (Associate Supervisor)

College of Nursing and Health Sciences, Flinders University, Australia

Associate Professor James Rogers (Adjunct Supervisor)

Faculty of Foreign Studies, Meijo University, Japan

TABLE OF CONTENTS

TABLE OF CONTENTS	I
ABSTRACT	V
DECLARATION	VII
DEDICATION	VIII
ACKNOWLEDGEMENTS	IX
LIST OF FIGURES	X
LIST OF TABLES	XI
PUBLICATIONS	XIII
GLOSSARY	XV
CHAPTER ONE INTRODUCTION	1
1.1 Research Background	1
1.2 Statement of the Research Problem	2
1.3 Thesis Objectives and Contributions.....	17
1.4 Thesis Outline	22
1.5 Chapter Summary	23
CHAPTER TWO REVIEW OF THE LITERATURE	25
2.1 Introduction.....	25
2.2 Theoretical Background on Vocabulary Learning.....	26
2.3 The Significance of Collocations	30
2.4 Collocation and Previous Approaches	36
2.5 Definition of Collocations in This Research.....	41
2.6 Counting Collocations.....	43
2.7 Identification of MWUs and Concgramming Method	48
2.8 Lack of Collocational Fluency and Related Issues	52
2.9 A Contrastive Perspective on L1 - L2 Congruency.....	55
2.10 Semantic Transparency	62
2.11 Learning MWUs.....	65

2.11.1 Incidental vs. Intentional Learning	66
2.11.2 Factors to Consider in Learning MWUs	70
2.12 Teaching MWUs	74
2.13 Assessing MWUs	78
2.14 Vocabulary Size and High-Frequency Lists	85
2.15 MWUs Resources	88
2.15.1 Corpus and CALL's Potential	92
2.15.2 Digital Flashcards Features	97
2.16 Chapter Summary	105
CHAPTER THREE RESEARCH METHODS	107
3.1 Introduction	107
3.2 Research Paradigm	108
3.3 Research Purpose and Overview of Research Questions	111
3.4 Approach to Replication	114
3.5 Research Instruments and Procedures	115
3.5.1 The Source of Data in This Study	115
3.5.2 L1 - L2 Congruency Rating	119
3.5.3 Semantic Transparency Classification	123
3.5.4 Test Procedure and Scoring	125
3.5.5 Pilot Study	129
3.6 Data Collection	130
3.6.1 Creating a MWU Resource	131
3.6.2 Participants	133
3.7 Data Analysis	136
3.8 Ethics and Politics	138
3.9 Chapter Summary	139
CHAPTER FOUR ANALYSIS AND RESULTS	141
4.1 Introduction	141
4.2 Scope of the Research Questions	141

4.3 L1 - L2 Contrastive Analysis (<i>RQ1</i>).....	143
4.4 Semantic Transparency Analysis (<i>RQ2</i>)	145
4.5 Measuring Productive Knowledge of MWUs	149
4.5.1 The Results of MWUs Test	151
4.5.2 Proficiency Level and Knowledge of MWUs (<i>RQ3</i>).....	151
4.5.3 Frequency Level and Knowledge of MWUs (<i>RQ4</i>)	153
4.5.4 Association Between Knowledge of MWUs and Influential Factors (<i>RQ5</i>).....	157
4.5.4.1 Relationship Between Frequency and Productive Knowledge of MWUs	157
4.5.4.2 Relationship Between Congruency and Productive Knowledge of MWUs...	161
4.5.4.3 Relationship Between Transparency and Productive Knowledge of MWUs	167
4.6 Chapter Summary	171
CHAPTER FIVE DISCUSSION.....	174
5.1 Introduction.....	174
5.2 Multi-Word Units Selection Criteria (<i>RQ1-2</i>)	177
5.3 Determinants of MWUs Knowledge (<i>RQ3-5</i>)	187
5.3.1 L2 Proficiency Effect	189
5.3.2 Frequency Effect.....	194
5.3.3 Congruency Effect.....	200
5.3.4 Semantic Transparency Effect	208
5.4 Chapter Summary	213
CHAPTER SIX CONCLUSION	217
6.1 Introduction.....	217
6.2 Overview of Findings	217
6.3 Theoretical and Practical Implications.....	219
6.3.1 Definitions and Classifications of MWUs	219
6.3.2 Challenges in Teaching and Learning MWUs.....	222
6.3.3 Implications for Language Teaching.....	225
6.4 Towards Effective Language Pedagogy	230
6.5 Contributions to Theory and Practice.....	236

6.6 Limitations	240
6.7 Directions for Future Research	246
6.8 Thesis Summary.....	248
REFERENCES	253
APPENDICES.....	299
Appendix A L1 - L2 Congruency Ratings	299
Appendix B Low L1 - L2 Rating	300
Appendix C Semantic Transparency Classification.....	301
Appendix D Number of Items in Each Frequency Level.....	302
Appendix E MWUs Test Items	304
Appendix F Participant Information Sheet.....	308
Appendix G MWU Test Results	311
Appendix H Human Ethics Approval	312

ABSTRACT

Existing research underscores the pivotal role of multi-word units (MWUs) in language acquisition, particularly in enhancing linguistic fluency. Factors such as L1 - L2 congruency and semantic transparency have been identified as crucial determinants of MWU learning difficulty. However, despite the significance of these criteria, there remains a notable gap in the literature regarding the prioritisation of MWUs based on L1 - L2 congruency and semantic transparency for language learners. This gap poses a challenge in developing effective language teaching materials tailored to learners' needs. This study aims to address the existing gap by examining the selection criteria for MWUs and their impact on the English proficiency of Persian-speaking learners. L1 - L2 congruency refers to the MWUs' meaning that is similar or dissimilar to the learners' L1, which poses one of the most significant barriers in L2 collocational processing. Semantic transparency characterises whether the combination of words in an MWU is straightforward and directly reflects the overall meaning (literal) or if the combination involves figurative elements that require additional interpretation (opaque). This study builds upon prior work by investigating MWU selection for Persian-speaking learners of English, with a particular emphasis on L1 - L2 congruency and semantic transparency. Through a contrastive analysis of Rogers's (2017a) list and transparency classification based on Grant and Bauer's (2004) taxonomy, results reveal a pronounced influence of L1 - L2 congruency on MWU selection, with incongruent items presenting higher learning burdens. With these insights in mind, a digital resource, the *General English Phrases* (GEP) list, is developed to aid learners in navigating MWUs effectively. This resource offers a comprehensive compilation of MWUs tailored to the needs of Persian learners, prioritising congruency with their native language and enhancing their acquisition journey. In addition, the study examined the productive knowledge of MWUs and the relationship between influential factors such as L1 - L2 congruency, semantic transparency, item frequency, and proficiency levels of Persian-speaking learners (N = 256) via a gap-filling test. Using bootstrapping with standardised bias, regression models were

utilised to discern interaction effects. Statistical analysis demonstrated a strong, positive correlation between MWU knowledge and proficiency, as measured by the International English Language Testing System (IELTS) scores. Moreover, the study identifies a decline in MWU knowledge as frequency decreases, with participants demonstrating higher proficiency in congruent and transparent MWUs. Notably, a significant interaction was found between L1 - L2 congruency and IELTS scores, emphasising the salience of L1 - L2 congruency in MWU learning. This study's contributions extend to identifying and ranking MWUs based on the frequency and L1 - L2 congruency, as exemplified in creating the GEP list. Overall, these findings deepen our understanding of collocational fluency among L2 learners and advocate for prioritising L1 - L2 congruency in language teaching materials and curriculum development. This research endeavours to enhance language learning experiences for Persian learners by bridging the identified gap in MWU selection criteria. By prioritising factors such as L1 - L2 congruency and semantic transparency, this study advocates for developing language teaching materials and curricula that better cater to the specific needs of learners, thereby promoting inclusivity and practicality in language education.

DECLARATION

I hereby declare that this thesis is an original work, not incorporating any material previously submitted for a degree or diploma in any university without acknowledgement. To the best of my knowledge and belief, it does not contain any material previously published or written by another person, except where due reference is made in the text. Furthermore, it will only be submitted for any other future degree or diploma with the permission of Flinders University.

Signed

Maryam Barghamadi

4/4/2024

DEDICATION

In memory of my dad, who sadly passed away on the 2nd of September, 2022, he encouraged me to do my best and taught me that it is never too late to follow my passion.

This thesis is also dedicated to my son, Parsa. Of all the many blessings I have had in this world, the greatest one was the honour of being your mum. My life has been challenging lately. I apologise for spending all my time researching and ignoring you, Parsa.

ACKNOWLEDGEMENTS

It is my pleasure to express my sincere appreciation to those who have contributed to the realisation of this research. Firstly, I honour and pay my respects to the Kaurna people, the traditional custodians of the land where this research unfolded. I acknowledge their deep connection to the country with profound gratitude. I am incredibly grateful to Flinders University, a catalyst for my PhD journey and the bestowal of the Australian Government Research Training Program Scholarship. Their generous support has breathed life into this thesis, making it a reality.

This research was indebted to a brilliant team of supervisors and advisors who provided unwavering support. Associate Professor Amanda Müller, my principal supervisor, deserves profound thanks for her invaluable guidance, understanding, and motivational spirit. Associate Professor James Rogers contributed significantly to the strength of this thesis through insightful discussions, enhancing its overall quality. I also sincerely appreciate Professor Joanne Arciuli's valuable suggestions and constructive criticisms.

I am particularly grateful to Dr Weifeng Han for his invaluable comments and guidance during the initial stages of my research. I thank Dr Pawel Skuza, the Statistical Consultant at Flinders University, for his insightful comments on the statistical analysis process. The study also owes its success to anonymous students and a dedicated research assistant whose participation was crucial in collecting data and formulating practical solutions.

I profoundly appreciate my examiners, Associate Professor Barry Lee Reynolds and Associate Professor Eman Adil Jaafar, for their invaluable feedback and constructive criticism throughout this process. Their expertise and insightful comments have significantly enhanced the quality of this research.

Finally, my deepest thanks go to my family for their unwavering support and endless encouragement throughout my PhD journey. Without them, this achievement would not have been possible.

LIST OF FIGURES

Figure 1 A Sample of a COLLEX Item (Gyllstad, 2009, p. 157)	79
Figure 2 Two Samples of COLLMATCH Items (Gyllstad, 2009, p. 158)	79
Figure 3 A Sample of DISCO Items (Eyckmans, 2009, p. 146)	80
Figure 4 Screen Shot of Sketch Engine for Language Learning (SkELL)	94
Figure 5 Screen Shot of IDIOM Search.....	94
Figure 6 The Leitner System.....	101
Figure 7 Sample of Initial Plan to Create Flashcards.....	132
Figure 8 Distribution of Persian-Speaking Participants' IELTS Scores	134
Figure 9 The Comparison Between IELTS Bands and the CEFR Level	135
Figure 10 Percentage of L1 - L2 Congruency Ratings of High-Frequency English MWUs with Persian Translation.	144
Figure 11 Semantic Transparency Classification of the Collocations Based on Grant and Bauer's (2004) Taxonomy.....	146
Figure 12 Scatter Plot for MWUs Test and IELTS Scores	152
Figure 13 Estimated Marginal Means of Frequency Levels	156
Figure 14 Normality of Standardised Residuals Between Frequency Levels.....	159
Figure 15 Normality of Standardised Residuals for Congruency	163
Figure 16 Scatterplot Incongruent with IELTS Score by Group Congruent.....	166
Figure 17 Scatterplot Congruent Centered with IELTS Score by Group Incongruent	166
Figure 18 Normality of Standardised Residuals for Transparency.....	169
Figure 19 Screenshot from Web-based General English Phrases for Rank 10	235

LIST OF TABLES

Table 1 An Example of a Concgram Search from the COCA for the Lemma 'Provide' and 'Support' (in Data from Rogers, 2017a, p. 26)	50
Table 2 MWUs Identified from 500 Example Sentences in Which the Lemma Pair 'Come' and 'Term' Both Occur in Rogers's (2017a, p. 29) Data	51
Table 3 Collocations Errors Based on L1 - L2 Congruency with Different Backgrounds	57
Table 4 Definition of Collocations Based on Semantic Transparency	62
Table 5 A Review of Test Items on Collocational Productive Knowledge Tests	83
Table 6 A Review of Test Items on Collocational Receptive Knowledge Tests	84
Table 7 Nakata's Flashcard Software Checklist	98
Table 8 Evaluation of Some Flashcards with General Features	102
Table 9 Sample of MWUs with L1 - L2 Congruency with Persian and Semantic Transparency Classification	125
Table 10 Number of Items Based on L1 - L2 Rating and Semantic Transparency	126
Table 11 Number of Items per Frequency Bands	127
Table 12 Sample of Initial Plan to Create Web-Based Resource	132
Table 13 Semantic Transparency Classification of the MWUs with L1 - L2 Rating Categorisation	147
Table 14 Pearson Correlation Between MWUs and IELTS Scores	153
Table 15 Bootstrapping Analysis of Mean Scores for the MWU Test by Frequency Level	154
Table 16 Testing the Assumption of Sphericity	154
Table 17 Tests of Within-Subjects Effects	155
Table 18 Pairwise Comparisons	156
Table 19 Pearson Correlation with Bootstrapping for MWU Test Items Organised by Frequency Level	158
Table 20 Hierarchical Multiple Regression Predicting IELTS Score from Frequency Levels	159

Table 21 Regression Coefficients by Interaction Frequency.....	161
Table 22 Descriptive Statistics of Mean Scores for MWUs Test Organised by Congruency	162
Table 23 Model Summary of Congruency and IELTS Scores.....	162
Table 24 Multiple Regression Results for Congruency	163
Table 25 Model Summary Organised by Interaction Congruency.....	164
Table 26 Table of ANOVA Organised by Interaction Congruency	165
Table 27 Regression Coefficient Organised by Interaction Congruency	165
Table 28 Descriptive Statistics of Mean Scores for MWUs Test Organised by Transparency	167
Table 29 Model Summary Organised by Transparency.....	168
Table 30 Regression Coefficients and Collinearity Statistics for Independent Variables....	169
Table 31 Multiple Regression Results for Transparency	170
Table 32 Regression Coefficients and Collinearity Statistics for Independent Variables....	170
Table A1 Sample of L1 - L2 Congruency Ratings.....	299
Table B1 Sample of MWUs with Low L1 - L2 Rating	300
Table C1 Sample of MWUs Based on Semantic Transparency Classification	301
Table D1 Number of Items in First Frequency Band Organised by L1 - L2 Congruency and Transparency Classification (F1= 2,803).....	302
Table D2 Number of Items in Second Frequency Band Organised by L1 - L2 Congruency and Transparency Classification (F2= 2,803)	302
Table D3 Number of Items in Third Frequency Band Organised by L1 - L2 Congruency and Transparency Classification (F3= 2,803).....	302
Table D4 Number of Items in Fourth Frequency Band Organised by L1 - L2 Congruency and Transparency Classification (F4= 2,803).....	303
Table E1 MWUS Test Items by Organising Congruency, Semantic Transparency from Four Frequency Levels.....	304
Table G1 Sample of MWU Test Results.....	311

PUBLICATIONS

Statement of authorship: I (Maryam Barghamadi) am the principal contributor to each chapter and the first author of the manuscripts derived from this thesis. My principal supervisor, Associate Professor Amanda Müller; associate supervisor, Professor Joanne Arciuli; and adjunct supervisor, Associate Professor James Rogers, are co-authors of the manuscripts produced from this thesis for peer-reviewed journals due to their significant contribution, advice, and guidance to the concept, study design, data collection, statistical analysis, and editing the manuscripts. Manuscripts produced from this thesis for peer-reviewed journals are the following:

Barghamadi, M., Rogers, J., Arciuli, J., & Müller, A. (2023). The use of semantic transparency and L1 - L2 congruency as multi-word unit selection criteria. *Studies in English Language and Education*, 10(2), 723-740.
<https://doi.org/10.24815/siele.v10i2.28644>

- ***This article received a Publication Award from Flinders University.***

SJR: Ranked a Q1 journal

Place of Publication: Indonesia

ISSN: 2355-2794 (print), 2461-0275 (online)

Barghamadi, M., Rogers, J., Arciuli, J., Han, W., & Müller, A. (2023). L1 - L2 Congruency as a Criterion to Identify Collocations Based on Contrastive Analysis. *Australian Journal of Applied Linguistics*, 6(1), 1-14. <https://doi.org/10.29140/ajal.v6n1.716>

Place of Publication: Australia

ISSN: 2209-095

Barghamadi, M., Rogers, J., & Müller, A. (2022). On the learning of multi-word units via flashcard applications. *Australian Journal of Applied Linguistics*, 5 (1),1–18.
<https://doi.org/10.29140/ajal.v5n1.643>

Place of Publication: Australia

ISSN: 2209-095

Barghamadi, M. (2020). A Critical Study of the Principles and Approaches to Needs Analysis. *Studies in Educational Management*,7,1-16.
<https://doi.org/10.32038/sem.2020.07.01>

ISSN: 2667-8594

Barghamadi, M., Rogers, J., Arciuli, J., & Muller, A. (**Under review**). Exploring the relationship between English proficiency and influential factors on productive knowledge of multi-word units.

Barghamadi, M., Rogers, J., Arciuli, J., & Muller, A. (**Under review**). Using CALL to identify and teach English multi-word units for direct study by Persian-speaking learners.

GLOSSARY

The following abbreviations and acronyms were used in the present research:

ANOVA	Analysis of variance
BCa	Bias-corrected and Accelerated
BNC	British National Corpus
CALL	Computer-Assisted Language Learning
CEFR	Common European Framework of Reference
CI	Confidence Interval
CLT	Communicative Language Teaching
COCA	Corpus of Contemporary American
EFL	English as a Foreign Language
ELT	English Language Teaching
ESL	English as a Second Language
F1	The First Frequency Band
F2	The Second Frequency Band
F3	The Third Frequency Band
F4	The Forth Frequency Band
FSs	Formulaic Sequences
GEP	General English Phrases
GTM	Grammar-Translation Method
Ha	Alternative Hypothesis
IELTS	International English Language Testing System

LCM	Lemmatised Concgram Method
L1	First Language
L2	Second Language
MALL	Mobile Assisted Language Learning
M	Mean
MI	Mutual Information
MWIs	Multi-word items
MWUs	Multi-word Units
NA	Needs Analysis
NLP	Natural Language Processing
ONCE	One Non-Compositional Element
RQ	Research Question
SLA	Second Language Acquisition
TOEFL	Test of English as a Foreign Language
TOEIC	Test of English for International Communication

CHAPTER ONE INTRODUCTION

1.1 Research Background

Multi-word units (MWUs)/collocations refer to word combinations that come together in expected patterns to create a unit, thereby encapsulating the idiomatic and coherent nature inherent in natural language expression¹. They play a crucial role in vocabulary knowledge and contribute to fluency in language usage (Webb, 2020a). For example, an easy MWU is like *I have a question*, a straightforward and common phrase used in various contexts. On the other hand, a more challenging MWU is the *kick the bucket*, which is an idiomatic expression that means *to die*. The difficulty arises because the individual words (*kick*, *the*, and *bucket*) do not contribute to the literal meaning of the expression. Instead, it relies on cultural and linguistic context for interpretation. These examples illustrate the range of complexity in MWUs, from simple, literal phrases to complex and idiomatic expressions.

Also, the correctness and acceptability of word combinations such as *grey hair* warrant particular attention among Persian-speaking English learners, who may inadvertently deviate by producing combinations like *white hair*. Such deviations in word combinations reflect linguistic parallelism with Persian patterns. This linguistic incongruence underscores the propensity for errors arising from reliance on direct word-for-word translations from Persian to English. As such, mastering MWUs is one of the most crucial parts of learning English to produce the natural language, which leads to improved comprehension for both the learner and their listeners (Hoey, 2005).

Similarly, current linguistic discourse investigates the crucial role of collocational knowledge in fostering fluency within second language acquisition (SLA). However, the practical application of this knowledge poses a challenge for learners in the L2 domain (Boers et al., 2014). This challenge emanates from a need for comprehensive collocational materials, contemporary resources, and explicit pedagogical interventions to augment

¹ The definition of "collocation" will be discussed in depth later in this chapter and chapter two (section 2.5).

collocational proficiency (Barghamadi et al., 2023; Wolter, 2020). A detailed examination of the obstacles that prevent students from attaining collocational fluency is prominently featured in this discourse, substantiating the present study's research objectives. This chapter explains the pivotal role and potential advantages of acquiring collocational competence within the L2 framework. In addition, the discussion acknowledges the inherent limitations intrinsic to teaching MWUs in the pedagogical milieu.

This study's principal objectives include identifying high-frequency MWUs in general English and developing a dedicated resource for Persian (Farsi) learners. This resource, designed for direct study, is a referential tool for curriculum designers and educators alike. Notably, the resource generated by this study is not meant to be an exhaustive list of MWUs. Instead, the study focuses on MWUs frequently used as pedagogically valuable entities. Persian-speaking English learners will benefit from tailored learning opportunities focusing on these prevalent MWUs, with subsequent assessments gauging their language proficiency.

Additionally, this research attempts to emphasise the potential effectiveness of corpus linguistics and computer-assisted language learning (CALL) approaches in enhancing the pedagogical effectiveness of MWU education. The present research addresses a gap by providing a comprehensive list of the most prominent collocations for direct study. Additionally, the study aims to substantiate the efficacy of this digital material as a pedagogical resource for Persian learners of English through empirical evidence. Consequently, by bridging the gap between Persian and English patterns, this research not only identifies common mistakes in collocation usage but also proposes practical solutions for improving learners' proficiency. By creating a large-scale list of the most valuable collocations to study directly, the emphasis on creating a useful resource for learners and educators demonstrates a holistic approach to language teaching.

1.2 Statement of the Research Problem

The intrinsic importance of vocabulary knowledge in enhancing fluency in both L1 and L2 contexts is well-documented by researchers such as Webb and Nation (2017). Furthermore, the growing consensus is that L2 learners benefit significantly from a robust lexical knowledge base, enhancing their overall language proficiency and competencies in the target language (Miralpeix & Muñoz, 2018; Zareva et al., 2005). This increase in lexical knowledge allows learners to understand and produce language more accurately and fluently, ultimately facilitating effective communication (Qian & Lin, 2020); recognising the importance of lexical knowledge solidifies its indispensable role in language acquisition and utilisation.

It can take time to determine what vocabulary knowledge entails. An inherent challenge lies in delineating the parameters of vocabulary knowledge, a contention that resonates within L2 learning research. Measuring lexical proficiency is controversial in L2 learning research (Zareva et al., 2005). However, researchers agree that assessing lexical proficiency requires an examination of *breadth* and *depth* of lexical knowledge (Crossley et al., 2015; Nguyen & Webb, 2017; Zareva et al., 2005). Breadth of vocabulary knowledge is encapsulated by the concept of "vocabulary size" and refers to the "quantity of vocabulary knowledge" or receptive vocabulary (Qian & Lin, 2020, p. 67). In contrast, depth of vocabulary knowledge is typically reflected in a student's familiarity with various facets of knowledge related to the word, including collocation, multiple meanings, and derivations (Nation, 2020; Webb, 2020a). This depth extends beyond mere awareness of the form-meaning connection, encompassing a more nuanced comprehension of the word's intricacies that also refers to "quantity of vocabulary knowledge" or productive vocabulary (Qian & Lin, 2020, p. 68). Consequently, the trajectory of vocabulary knowledge unfolds from a grasp of word forms and meanings (receptive knowledge) to applying words in practical communication scenarios (productive knowledge), leading to effective communication. Hence, collocations are integral constituents of productive knowledge. Together, collocations assume paramount significance in this comprehensive framework, necessitating their inclusion in the pursuit of elevated vocabulary proficiency.

The term collocation stemmed from a term that Lewis (1993) refers to as 'grammaticalised lexis', which requires knowing the words or word categories present by combining other words. 'Knowing a word' comprises, among other things, its semantics and the collocates it frequently occurs with (Nation, 2013), which leads to the creation of word combinations referred to as MWUs. This study uses collocations and MWUs interchangeably and defines them as single entities. Various researchers have defined "collocations or MWUs differently" regarding words occurring together (Rogers et al., 2021, p. 143). In fact, more than 50 terms have emerged, such as *fixed combinations*, *lexical phrases*, *chunks*, *prefabricated*, *formula units*, *ready-made utterances*, and other cases (Kjellmer, 1994, p. xi). Conversely, numerous umbrella terms such as multi-word expressions (MWEs), multi-word items (MWIs), MWUs, or formulaic sequences (FSs) have been employed to encompass this diverse range of classifications.

Evidence from corpus studies has shown that 50% of spoken and written discourses consisted of MWUs (e.g., Erman & Warren, 2000). In this regard, Erman and Warren (2000, p. 34) analysed nineteen passages. This set includes seven extracts ranging from 600 to 800 words from different texts in *The London Lund Corpus of Spoken English*. Additionally, they incorporated ten extracts spanning 100 to 400 words, obtained from various text types in the *Lancaster-Oslo-Bergen Corpus*, which represents written English. Also, they included two 400-word passages from distinct versions of the *Goldilocks* narrative. The results indicated that the prevalence of prefabricated expressions is slightly higher in spoken than written language, with percentages of 59% and 52%, respectively. Therefore, they concluded that learning and teaching foreign languages can benefit from an increased awareness of the prevalence and significance of prefabricated expressions. Such awareness can enhance students' learning strategies and proficiency in a foreign language.

Moreover, substantial research indicated that English speakers (L1) rely on MWUs (e.g., Cowie, 1992; Hoey, 2005). More specially, Cowie (1992) investigated high-quality lexical patterns in daily and *Sunday* newspapers to support the notion that journalistic writing heavily relies on verb-noun collocations that are already established and widely recognised.

Cowie noted that news writers generally avoid hard idioms and prefer combinations where the figurative meaning of the verb is now obsolete. The prevalence of familiar phrases in news coverage suggests that journalists' professional skills are more about memorising and reusing existing phrases than verbal creativity.

Furthermore, extensive psycholinguistic evidence shows that adults and children understand and produce MWUs during comprehension and production (e.g., Jolsavi et al., 2013). This has spurred a significant surge in research over the last two decades within the domain of L2 acquisition, with a specific focus on MWUs and an emphasis on scrutinising the intricacies of their learning processes (e.g., Yamagata et al., 2023). The heightened attention to MWUs in L2 acquisition research reflects a growing recognition of their pivotal role in language learning. Moreover, the scholarly landscape has witnessed an increased emphasis on collocation acquisition, as Pellicer-Sánchez underscored (2020). This shift toward understanding and prioritising collocations is informed by several compelling reasons, further enriching the ongoing discourse on language acquisition and usage.

The paramount importance of collocations becomes evident when examining the positive correlation between L2 proficiency levels and collocational knowledge (e.g., Vu & Peters, 2022b), leading to a high communication level. This L2 proficiency level has been referred to as idiomatic production by many scholars, and a critical factor is learning collocations (e.g., Almela & Sánchez, 2007; Cowie, 1991, 1992; Hoey, 2005). For example, Cowie (1992, p. 10) stated, "It is impossible to perform at a level acceptable to native users, in writing or speech, without controlling an appropriate range of multi-word units." Consequently, mastering collocations not only facilitates conversational production but also ensures effective communication. In doing so, learning collocations prevent the occurrence of unacceptable structures that may disrupt fluent linguistic exchanges. Hence, collocational knowledge makes the learner sound more natural (e.g., Durrant & Schmitt, 2009; Wray, 2002). It is also helpful for efficient comprehension (Nation, 2013) during L2 learning. As a result, collocations are essential to L2 learners' proficiency because meanings are created through conventional word relations that underlie advanced performance.

The evidence indicates that collocations are retrieved from memory as 'holistic units' or 'chunks' in long-term memory (Schmitt & Carter, 2004; Wray, 2002). However, contrary to this view, proponents of usage-based theory in recent psycholinguistic research argue against attributing a processing advantage to MWUs as holistic units. Instead, the usage-based theory posits that MWUs may be recorded without assuming that they are held together as a whole only by activating the whole with a more significant increase in usage (e.g., Arnon & Snider, 2010; Siyanova-Chanturia, 2015). In this view, the human brain is sensitive to the frequency of exposure, and their patterns become fixed by the repetition of use. This form of storage "contributes to fluency" (Nation, 2020, p. 22) by reducing learners' cognitive effort and making for more efficient language processing (Nation, 2001; Snellings et al., 2002). Finally, efficient comprehension occurs when a passage of text can be understood without paying attention to every word (Hunston & Francis, 2000, p. 270). Ultimately, incorporating prefabricated chunks² facilitates efficient comprehension, allowing for more streamlined and effective communication between speakers and listeners.

Furthermore, collocations have received increased attention since researchers found that a reasonable percentage of spoken and written discourse consisted of prefabricated chunks (e.g., Erman & Warren, 2000; P. Foster, 2001; Hill, 2000; Jackendoff, 1997). This perspective has been supported by scholars such as Pellicer-Sánchez (2020, p. 158), who stated that MWUs "should be a component of the vocabulary learning curriculum." Similarly, Lewis (2000, p. 8) claimed that collocations "should be a top priority in every language course," and collocations are vital in language teaching (Millar, 2011). Embracing this viewpoint highlights the importance of MWUs in achieving linguistic fluency and sparks considerable interest in SLA by addressing specific learning challenges and enhancing instructional effectiveness. By focusing on MWUs and collocations, researchers and educators can better understand and overcome common obstacles in language learning, such as improving learners' ability to use language naturally and fluently.

² In the context of language learning and linguistics, "prefabricated chunks" refer to sequences of words commonly used together and synonymous with the terms MWUs.

Thus, this perspective offers valuable insights for course designers and material developers by guiding them to prioritise the inclusion of MWUs and collocations in language curricula. This focus can create more effective, engaging instructional materials that facilitate better learning outcomes. By incorporating these elements, course designers can help learners acquire language skills that reflect authentic language use, thereby improving overall language proficiency and communication abilities.

Despite the prominent role of MWUs, learning MWUs is perhaps the most challenging aspect of learning and teaching English due to various factors. First, terminological issues make conducting research difficult (Wolter, 2020) due to the lack of agreement on a unique definition for MWUs. This variety in terminology can be confusing for both teachers and researchers trying to develop a thorough understanding of the different types of MWUs and what sets them apart. Wray (2000, p. 465) highlighted this issue by identifying approximately 50 different terms used to describe MWUs in a detailed literature review. These terms refer to various subcategories under the umbrella of MWUs, including 'idioms' (*spill the beans*), 'collocations' (*strong tea*), 'chunks,' 'prefabs,' 'phrasal verbs' (*give up*), 'lexical bundles' (*as a result*), 'formulae' (*good luck*), 'fixed expressions' (*by and large*), 'fixed phrases,' 'lexical phrases,' 'phrasal lexemes,' 'phrasemes,' and more (Martinez & Schmitt, 2012; Simpson-Vlach & N. Ellis, 2010; Wray, 2002). This diversity in terminology and classification can make it challenging to standardise research and teaching approaches in the field of language acquisition.

Throughout this thesis, the terms MWUs and collocations have been used interchangeably to refer to sequences of words commonly occurring together in language use. This approach acknowledges the diverse terminology and classification of MWUs in the literature, including terms such as idioms, phrasal verbs, and lexical bundles (Wray, 2000; Martinez & Schmitt, 2012). By using MWUs and collocations synonymously, this thesis aims to encompass the various types of fixed and semi-fixed expressions essential for understanding language acquisition and fluency.

Hence, it makes logical sense to integrate various approaches in collocational research to formulate a better definition of this concept. Notably, frequency-based (e.g., Sinclair, 1991) and phraseological (e.g., Nesselhauf, 2003) approaches stand out as dominant methodologies in this field. Frequency-based approaches characterise collocations as word combinations that occur together more frequently than chance would predict. In contrast, in phraseological approaches, a collocation is distinguished from a free combination of semantically transparent terms by its constrained substitutability. Some scholars combined these two approaches to defining collocations (e.g., Leśniewska & Witalisz, 2007). It can also be another issue in that some items would be classified as collocations with one approach while these items are not in another approach. For example, the phrase *hit the hay* could be labelled as a collocation due to its frequent co-occurrence in informal language. In contrast, it is viewed as an idiom, emphasising its non-literal connotations (Matthews, 2014). Consequently, they would differ if these two approaches attempted to create a single list of collocations.

Accordingly, numerous scholars have used a frequency-based approach to identify high-frequency collocations for assessing their target groups (e.g., Macis et al., 2021). The purpose of the current research was not to determine collocations from a new perspective. Instead, the researcher sought to identify the value of the items in teaching English to Persian EFL learners. In the proposed research, a lemmatised concgramming method (LCM)³ is paired with a conventional viewpoint of frequency of co-occurrence (Biber et al., 1999) to define and select meaningful MWUs. As a result, regardless of whether they are phrasal verbs or idioms, all the MWUs found are treated equally in this study. This perspective identifies collocations and MWUs as one entity between transparency and non-transparency.

Second, salient issues to learning collocations come from the nature of collocations. English is full of word combinations with arbitrary restrictions on their co-occurrence; they

³ LCM is discussed in more detail in section 2.7.

are not following the rule-governed (Sinclair, 1991). For instance, using *null* and *void* rather than *null and invalid* might be customary in legal documents, even though both expressions convey a similar legal concept. This preference concerns adhering to established legal language traditions more than any inherent linguistic requirement. Adhering to such arbitrary restrictions contributes to legal communication's formal and standardised nature. Jaén (2007) found that university students in Spain had difficulty with English collocations because of the arbitrary way they are formed. In this regard, no rule explains that *the force of law* cannot be replaced by its synonyms and changed into *the power of rule*. This issue becomes challenging and prominent with de-lexical verbs (e.g., *make, have, do, get*). For instance, *make your homework* (do your homework) by Dutch learners (Peters, 2016) and *have risk* (take a risk) by Chinese learners (Zhou, 2016) were some errors reported in different contexts.

Without a doubt, many previous studies have indicated that L2 learners have problems with collocation production, even for high proficiency level learners (e.g., Laufer & Waldman, 2011; Men, 2018; Nesselhauf, 2003, 2005; Zhou, 2016). More specifically, Laufer and Waldman (2011) found many incorrect verb + noun collocations (in a corpus with 300,000 words). The findings indicated that L1 Hebrew students of English at three different proficiency levels showed incorrect use of a third of verb-noun collocations. A similar pattern was observed in Nesselhauf's (2005) study among advanced German learners. The researchers identified that verb-noun collocations continued to be a persistent challenge for advanced learners of English. For instance, learners often struggle with combinations such as *make a decision, take a risk, give a presentation, do research* (Men, 2018; Nesselhauf, 2005).

These collocations involve specific pairings of verbs and nouns that fluent speakers use naturally but are challenging for learners to acquire due to their idiomatic nature and lack of direct translation into learners' first languages (Boers & Lindstromberg, 2009; Erman & Warren, 2000). Overall, the consensus from the studies reviewed is that errors in collocations by L2 learners primarily stem from L1 interference, indicating the learners'

tendency to rely on their native language. Moreover, the studies underscored that verb + noun collocations pose particularly significant challenges.

The exciting results from reviewing collocational research were obtained when the production of L2 learners was compared with that of English L1 speakers. In this regard, it was found that L2 learners used significantly fewer collocations than L1 English speakers (e.g., Laufer & Waldman, 2011). Learners tend to overuse collocations that they are familiar with, referred to as “collocational teddy bears” (Nesselhauf, 2005, p. 69). Meanwhile, learners tend to avoid or underuse those collocations they are unsure how to use. Also, Fan (2009) reported that English speakers use informal collocations, which they did not find in the L2 learners’ data. Therefore, these studies revealed that aside from insufficient collocation use, certain collocations are overused or underused.

In this regard, the exposure of L2 learners to collocations in English courses may be hampered by a significant gap in L2 textbooks. This has been highlighted by several studies (e.g., Molavi et al., 2014; Tsai, 2015; Vu & Michel, 2021). For instance, Molavi et al. (2014) and Tsai (2015) investigated the type and frequency of lexical collocations in three ELT English language teaching (ELT) textbook series in Iran and Taiwan, respectively. The researchers concluded that the limited range of collocations in textbooks meant that there needed to be more repetitions of collocations to enable the learner to consolidate knowledge. Thus, the selected books were unreliable and did not impact learners' understanding of collocations. In other words, MWUs are “neglected in language courses” (Wolter, 2020, p. 493).

Some books consider and focus on collocations individually. For example, *English Collocations in Use* is a self-study resource for general English by McCarthy and O'Dell (2005). The book was written based on themes instead of frequency for different levels. It used the Cambridge International Corpus of Written and Spoken English, which is inaccessible to researchers. However, the sheer volume of around 5,000 collocations in the book does pose a challenge. While it is a rich repository, it might be overwhelming for learners to tackle such many items.

As a result, many researchers have compiled collocations lists using corpus analyses. An assessment of these lists revealed that more MWU lists concentrate on academic collocations (e.g., Ackermann & Chen, 2013; Biber et al., 2004; Durrant, 2009; Rogers et al., 2021; Simpson-Vlach & N. Ellis, 2010). Some lists focus on general English collocations but are constrained in terms of the number of words and the selection criteria. For instance, Martinez and Schmitt's (2012) Phrase List identified 505 non-transparent phrases for general English. They argue that non-transparent or non-compositional MWUs are beneficial for L2 learners. Shin (2006) utilised corpus frequency data of co-occurring words to identify high-frequency items and grammatical well-formedness. He found only 1,000 meaningful and memorable units for Korean beginner learners.

Shin and Chon (2019) created the COCA_MWU20 list, offering a more extensive and comprehensive resource. This list consists of 10,000 MWU families, graded based on grammatical well-formedness, range (distribution across different types of corpora), and frequency within the Corpus of Contemporary American English (COCA). However, the COCA_MWU20 list stands out for its comprehensive nature and potential applicability in language pedagogy and research; its limitations are related to the selection criteria.

Since little attention has been paid to MWUs in language courses and activities (e.g., Boers et al., 2017), there needs to be an agreement about selecting and identifying MWUs. In the meantime, a significant problem with insufficient MWU resources may be related to the fact that researchers confront challenges in identifying useful collocations to learn and that methodology and criteria need to be verified. On the other hand, several studies have shown that certain factors affect the learnability of L2 collocations. Such factors include collocational frequency, L1 - L2 congruency, and semantic transparency. For example, there is evidence that more frequent items are learned faster when learning MWUs (e.g., Wolter & Gyllstad, 2013). In addition, evidence indicated a significant decrease in collocation knowledge at the first three-word frequency levels: 1,000, 2,000, and 3,000 (Nguyen & Webb, 2017).

However, Nguyen and Webb (2017) concluded that a collocation's learnability is influenced by both its overall frequency and the frequencies of the words it contains. This perspective aligns with the idea that frequent exposure to collocations and familiarity with the constituent words contribute to better learning outcomes. In contrast, Vu and Peters (2021) reported that frequency was not a significant predictor. The disagreement between Nguyen and Webb (2017) and Vu and Peters (2021) on the significance of frequency as a predictor for collocation learnability suggests a lack of consensus in the existing literature. Recognising that the mixed results may stem from methodological differences, participant characteristics, or other variables that could impact the outcomes is essential. It may be premature to suggest including frequency in creating a resource based on the conclusion of one study (Nguyen & Webb, 2017). It would be more appropriate to acknowledge the conflicting findings and emphasise the need for a cautious approach in incorporating frequency into educational resources.

Another influence on learnability is congruency. Considerable research has found that congruent collocations (the equivalent of L1 translations) are less complicated than incongruent collocations (e.g., Yamashita & Jiang, 2010). In this regard, Yamashita and Jiang's study (2010) found that Japanese EFL learners make more errors and react more slowly to incongruent collocations. Furthermore, congruency or non-congruency between the L1 and the L2 could be the most significant "barrier in L2 collocational processing" (Gyllstad & Wolter, 2016, p. 318). For instance, English learners with a Chinese background "*take medicine*" is a mistake they commonly make because their L1 word sense leads them to equate it with "*eat medicine*" (Chan & Liou, 2005, p. 231). This circumstance could be correct for Persian learners of English to use *eat/ use medicine*.

The role of congruency is well documented in SLA research for English learners and recognised as a critical issue for translation trainees and those learning other languages. A growing body of literature has examined collocation as challenging for translators, primarily for incongruent items (Haghighi & Hemmati, 2018; Sonbul et al., 2022). For instance, Sonbul et al. (2022) demonstrated that congruency and form recall knowledge influence the ability to

produce acceptable collocations in an English-to-Arabic translation task. The authors recommended that translation classes should emphasise incongruent and opaque items explicitly.

Regarding the role of congruency in languages other than English, Boone et al. (2022) investigated the effect of corpus frequency, L1 - L2 congruency, imageability, and association strength in a longitudinal study with 50 Dutch (L1) undergraduate students majoring in German. In a mixed-effect model, the results showed a significant effect between congruency and time. The findings suggest that teachers and material developers should emphasise congruency with particular attention given to incongruent items. Hence, this research raises the possibility that learners may make errors when they rely on their L1 word patterns to select L2 words. As such, learners may experience an L1 - L2 transfer error.

Still, some solutions could be provided to address this L1 - L2 incongruency issue. First, incongruent collocations were recommended to receive more teaching time (e.g., Boone et al., 2022; Chan & Liou, 2005). Second, the emphasis on non-congruent L1 - L2 collocations should be increased (e.g., Wolter & Gyllstad, 2011). Recent studies indeed show that the effect of congruency varies, and some mixed findings were found for the benefits of explicitly learning incongruent collocations (e.g., Ding & Reynolds, 2019; Fang & Zhang, 2021; Men, 2018). In particular, Fang and Zhang (2021) found a significant improvement in accuracy, but not speed, in the L2 group in evaluating congruent collocations as opposed to incongruent collocations with intermediate and advanced Chinese-English learners. Thus, it would be essential for L2 learners to get more input or more frequent encounters with an incongruent L2 for accuracy.

A contrastive analysis that considers L1 - L2 congruency as a criterion can help identify MWUs and reduce errors caused by L1 influence. Contrastive analysis is a well-known theory of determining the impact of L1 on L2 by identifying similarities and differences between the learners' L1 and L2 (Boone et al., 2022). These similarities and differences can provide insights into what challenges a particular L2 will present to the learners. Therefore, “contrastive analysis would be desirable” (Nesselhauf, 2005, p. 272) and essential in

teaching collocations (Boone et al., 2022; Laufer & Girsai, 2008). In this regard, some researchers recommended making L2 learners aware of collocations, such as differences and similarities, via contrastive analysis and pointing out collocations whose translations do not have direct equivalence between the two languages (e.g., Bahns, 1993; Boone & Eyckmans, 2023; Laufer & Girsai, 2008; Peters, 2009).

Some researchers argue that contrastive analysis is fundamental to creating English materials (R. Ellis & Barkhuizen, 2005; Keshavarz, 2011). R. Ellis and Barkhuizen (2005, p. 52) stated that contrastive analysis serves two purposes. First, contrastive analysis explains the learner's errors. Second, it acts as a data source to define the systemic areas that the target language teachers want to consider. Proponents of contrastive analysis believe it would be "the main criterion for preparing instructional materials" (Keshavarz, 2011, p. 9). The belief among proponents that it could be the primary criterion for preparing instructional materials raises questions about its potential impact on the enhancement of collocational resources.

In addition to frequency and congruency, semantic transparency has also been a factor in identifying collocations in the phraseological approach. Semantic transparency refers to the literal or idiomatic nature of collocations. Some scholars, such as Moon (1994, 1997) and Van der Meer (1998), advocated teaching semantic non-transparent words directly to L2 learners. Consequently, some collocation lists are based on non-transparent items, such as Martinez and Schmitt's (2012) *Phrase List*, which has 505 items for general English. Also, Shin and Chon (2019) noted that focusing on non-compositional MWUs in their list (COCA_MWU20 list) can be particularly beneficial for language learners, especially when they have limited time available for study. Moreover, Macis and Schmitt (2017a) found that collocations with more transparent meanings were learned before those that were less transparent, and 22% out of 54 collocations examined were figurative. As a result, Macis and Schmitt (2017a) concluded that when teaching collocations, it is essential for teachers to consider figurative meanings when using them.

For instance, Persian learners of English may find it challenging to understand semi-transparent MWUs, such as *take care*, compared to more literal expressions like *take a photo*. However, these semi-transparent collocations are still less complex than entirely figurative ones, such as *take someone to task*, because their meanings are not immediately apparent from the individual words. In this regard, Shin and Chon (2019) claimed that L2 learners face issues with various types of MWUs of different compositional levels. Transparent MWUs, despite their apparent simplicity, can still be problematic for L2 learners. This is especially true when learners attempt to apply their knowledge of synonymous collocates, as in the case of “*begin the engine*” versus “*start the engine*” (Shin & Chon, 2019, p. 610).

On the other hand, a frequently used collocation is likely to have transparent meanings, whereas a collocation with less transparent meanings is more likely to be infrequent (Webb et al., 2013). Rogers's (2017a) large corpus study revealed that 86% of identified MWUs were literal formulations, emphasising the prevalence of transparent expressions. This insight prompts a critical consideration: if the goal is to teach non-transparent terms directly to L2 learners, it might be prudent to prioritise the most high-frequency collocations with literal formulations. To this end, excluding less frequent and less transparent collocations in teaching and material development may be necessary. Rogers (2017a) considered congruency and semantic transparency as fundamental criteria for developing a new resource for Japanese learners in a large-scale study.

Rogers utilised the Corpus of Contemporary American English (COCA) (Davies, 2008) and lemmatised the concgram method, identifying over 11,200 MWUs that contain around 3,000-word families or 5,000 lemmas. Rogers tested several parameters to determine whether or not selected items were helpful across a wide range of genres and to find MWUs over time. These parameters included corpus dispersion, chronological data, colligation consideration, and semantic transparency. Rogers found that L1 - L2 congruency was a critical criterion for developing a collocational resource for Japanese learners of English when half of the items were incongruent. For instance, the author explained that *eat*

breakfast is word-for-word equal to *asagohan wo taberu* in Japanese. Due to the L1 - L2 congruency, Japanese learners proficient in English vocabulary and grammatical structure will likely construct this MWU with minimal error. However, linguistic congruence is not always perfect. Also, the phrase *get credits* for a college course is how we express it in English. Still, Japanese learners frequently mistranslate it as "*take credits*" (*tanii wo toru*), as the verb "*toru*" means "*to take*" in English (Rogers, 2017a, p. 4).

It is imperative to discern between L1 - L2 congruence and semantic transparency, a concept that Rogers's research has significantly advanced. The concept of congruency, in this context, pertains to the translation of English collocations into the learners' L1. At the same time, semantic transparency explores the literal or opaque meaning of MWUs. Rogers's work involved classifying around 11,000 MWUs into literal, figurative, and core idioms, establishing it as a pivotal foundation within the field. For instance, *a business card* was found to be incongruent with Japanese, yet it was classified as having a literal meaning. This led to the discovery that 86% of the MWUs in his list were literal formulations.

As Rogers pointed out, the high ratio of incongruent collocations underscores the need for further research in second language learning and collocations. The L1 - L2 congruency could be a fundamental criterion for providing collocation resources and avoiding errors due to L1 influence. The fact that this criterion has yet to be addressed in materials development is a call to action for more research. For instance, Shin (2006) states that L1 - L2 congruency is a fundamental factor, but his study only investigated 10% of the English collocations for congruency with Korean. This highlights the need for more comprehensive research in this area.

Moreover, the evaluation of previous collocation research has revealed a lack of total congruency between different languages and English. For instance, the phrases *take a photo* and *do your homework* are congruent with Persian and English. However, they are not congruent with German (*make a photo*) and Dutch (*make your homework*), respectively (Gyllstad, 2005; Peters, 2016). Such findings underscore the importance of considering language-specific nuances in collocations when designing language materials or teaching

strategies. It is a reminder that a one-size-fits-all approach might not be practical.

Understanding the peculiarities of each language is crucial for accurate language learning.

As previously mentioned, L2 learners necessitate alternative input sources to augment their acquisition of collocations. The explicit teaching of all word combinations is impractical, thus underscoring the need to discern which collocations merit explicit instructional focus. Consequently, further research is warranted to determine the prioritisation of MWUs for learning, the criteria for selecting beneficial collocations, and the factors influencing the learnability of L2 collocations. This research is particularly timely, as empirical evidence indicates the significance of L1 - L2 congruency and semantic transparency in the acquisition of collocations. Notably, limited efforts have been made to establish an English collocation resource based on these criteria (Rogers, 2017a). A study is underway to examine whether L1 - L2 congruency or semantic transparency are pivotal criteria for selecting English MWUs that necessitate explicit instruction for Persian EFL learners. The study entails the identification of MWUs to create a collocational resource, the explicit instruction of these units, and the subsequent evaluation of outcomes.

Computer-Assisted Language Learning (CALL) offers groundbreaking solutions for language education, providing interactive and engaging tools that notably enhance the learning process (e.g., Mirzaei, 2022). Flashcard applications, a quintessential CALL tool, prove efficacious for memorising vocabulary and collocations owing to their repetitive and interactive nature (Nakata, 2008, 2020). Leveraging the potential of CALL, the present study endeavours to develop a digital teaching tool that incorporates these MWUs, offering a fresh perspective for second language practitioners and a blueprint for integrating MWUs into their courses. This approach facilitates collocation retention and optimises the efficacy of explicit instruction through digital modalities.

1.3 Thesis Objectives and Contributions

It is widely acknowledged that the goal of research on MWUs in L2 is to understand what L2 learners need to achieve collocational knowledge (Laufer & Waldman, 2011), their

challenges, and the factors influencing their learning. While the deficiency in learning materials is acknowledged as a significant challenge for teaching and learning collocations (Koosha & Jafarpour, 2006), it is essential to explore the underlying causes of this gap. Understanding whether it stems from a lack of available resources, issues with existing materials, or a gap in understanding learner needs can guide the development of a more targeted and practical resource. Hence, the primary objective of this study is to create a novel resource tailored for Persian learners of English. Utilising L1 - L2 congruency or semantic transparency as the primary criterion for constructing a collocational resource and identifying specific collocations that merit increased study time.

The similarity between L1 and L2 is crucial in determining collocation knowledge regarding collocation learning (Sonbul et al., 2022). Transferring from the L1 of learners to the target language might result in positive productivity and satisfaction if L1 and L2 coincide exactly (R. Ellis, 2008). For instance, research by Granger (1998) found that L2 learners employ direct L1 counterparts more frequently than terms that sound more like native speakers. However, due to the link between languages, word-for-word translation in most languages might have a significant possibility for inaccuracy.

Semantic transparency refers to the literal or opaque meaning of MWUs (Rogers, 2017a). Semantic transparency is the primary criterion for collocation identification in the phraseological approach (Wolter & Yamashita, 2015). This study investigates whether this criterion helps select valuable collocations. Although the previous research, as mentioned in this chapter, indicated that opaque items are infrequent and the majority are literal (e.g., Barghamadi et al., 2023; Rogers, 2017a), the findings would confirm the principle of selecting items based on congruency. The value of identifying these items is for studying and teaching them explicitly. For example, *take a photo* is a correct collocation in English and literally (ʔäks bi:ri/عكس بگیر) in Persian, whereas *mach ein foto* or *make a photo* is used by German learners (Gyllstad, 2005) due to L1 interference. These examples demonstrate no total congruency for L1 German speakers of L2 English.

In light of transparency, phrases such as *take medicine*, and *make a decision* have literal meanings and are classified as Literal/Compositional word combinations. In comparison, they are somewhat incongruent with Persian since *take* is equal to *use/eat*, and *make* is equivalent to *take* in Persian. Therefore, these word combinations have literal meanings for L1 Persian speakers of L2 English that reduce the role of semantic transparency as a primary criterion for this particular collocation.

The scope of research contained in this thesis is twofold. The first objective of this research is to test whether L1 - L2 congruency or semantic transparency represent fundamental criteria for choosing useful English MWUs to teach Persian-speaking L2 English learners explicitly. The hypothesis behind this target is that the MWUs with low congruency need more teaching time. L1 - L2 contrastive analysis is tested as an efficient criterion to identify collocations requiring special attention to help learners avoid errors caused by the L1 influence. In particular, the study focuses on the similarity and dissimilarity between L1 and L2. This kind of L1 - L2 contrastive analysis was conducted for Rogers's (2017a) list, which consists of 11,212 MWUs. The results of this study can be used to create ELT materials for particular groups based on their needs, in contrast to the existing generic textbooks that have been prepared. Taking into account the hypotheses, the following five research questions (RQs) were addressed:

1. To what extent should L1 - L2 congruency be a selection criterion for developing materials for Persian-speaking learners of English?
2. To what extent should semantic transparency be a selection criterion for developing materials for Persian-speaking learners of English?
3. Is there a relationship between knowledge of MWUs and Persian-speaking learners' L2 English proficiency?
4. To what extent does Persian-speaking L2 English learners' productive collocation knowledge change over MWU frequency levels?
5. To what extent do the frequency levels, congruency, and transparency of MWUs predict Persian-speaking L2 English learners' proficiency?

- a) How much variance in participants' IELTS scores is explained by the frequency of MWUs?
- b) How much variance in participants' IELTS scores is explained by congruent and non-congruent MWUs?
- c) How much variance in participants' IELTS scores is explained by semantic and opaque MWUs?

Moving to the MWU selection criteria and in line with Rogers's (2017a) study, the present study expects to find congruency as a fundamental criterion for considering MWU resources for Persian-speaking learners (RQ1 & RQ2). With advances in technology and emerging CALL in L2 learning, digital materials could improve the functionality of traditional materials by using additional audio, visual, and multifaceted stimuli, which leads to enhanced learning (see Barghamadi et al., 2022 for more details). Therefore, a growing technological capacity combined with a large corpus can assist in identifying MWUs. Furthermore, syllabus designers can use computers and software packages to develop materials in addition to their intuition and teaching experience. Consequently, the high-frequency MWU items selected in this research create a digital resource.

The second objective of this research is to examine productive knowledge of collocations and the relationship between L1 - L2 congruency, semantic transparency, item frequency, and proficiency levels by utilising the innovative high-frequency MWU list. Several studies have investigated collocational knowledge and what factors increase the learnability of these items (e.g., Boone & Eyckmans, 2023; Sonbul et al., 2022). However, it is necessary to conduct further research because the findings are mixed. The rationale behind assessing learners' knowledge is to improve language learning programs. Teachers may need to determine students' understanding of collocations. Teachers are advised to focus on specific MWUs according to various influencing factors to reduce the learning burden of L2 acquisition and their teaching. Therefore, exploring L2 collocation knowledge may provide insight into teaching, learning, and designing curricula. Also, assessing learners' knowledge

of collocations can help determine which items to include and which to consider in teaching and learning resources. To gain a deeper understanding of the effect of various factors on knowledge of MWUs, research questions 3 to 5 were addressed.

Additionally, collocation processing studies indicated that congruent collocations (word-for-word translations of the L2 collocations equal to learners' L1) have less learning burden than incongruent ones (e.g., Ding & Reynolds, 2019). Also, learners struggle to comprehend figurative collocations (Macis & Schmitt, 2017). Therefore, this study follows these views as two alternative hypotheses (H_a) for Persian EFL learners.

- H_{a1} : Persian-speaking L2 English learners obtain better scores for congruent collocations than incongruent collocations.
- H_{a2} : Persian-speaking L2 English learners obtain low scores for figurative collocations.

Considering RQ3, the present research expects a positive relationship between proficiency level (as measured by IELTS score) and MWUs knowledge, as seen in Vu and Peters' (2022b) study. Based on evidence from Nguyen and Webb (2017), this research predicts productive knowledge of MWUs change over MWUs frequency levels (RQ4). Concerning RQ5 and alternate two hypotheses by examining the influence of various factors on learning MWUs, this study predicts learners score better on congruent collocations and literal items.

In brief, the original contribution of this research involves:

- Identifying a list of high-frequency English collocations with low L1 - L2 congruency for Persian learners
- Probing the role of semantic transparency
- Creating a digital format material that consists of MWUs and example sentences

- Exploring Persian learners' knowledge of English MWU and its relationship to proficiency levels (as measured by IELTS score), L1 - L2 congruency, item frequency, and semantic transparency.

1.4 Thesis Outline

This thesis is divided into six chapters. The thesis opens with an 'Introduction' organised into three sections. In this chapter, the research problem and significance of the study were described by highlighting the role of MWUs, the challenging learning process, the difficulty of identifying MWUs, and insufficient MWU resources. Subsequently, the 'objectives and contributions' section presents the original contribution of this research by considering the creation of a new and digital MWUs resource for Persian EFL learners. Furthermore, factors affecting the learning of MWUs are examined. These factors include L1 - L2 congruency, semantic transparency, item frequency, and learners' proficiency levels.

Chapter 2 reviews the theoretical perspective on vocabulary learning and its link to MWUs or collocations, along with probing previous empirical research. To define the notion of MWUs, previous approaches and methods in counting collocations, concgramming as an innovative method to identify MWUs, and the rationale behind following Rogers's (2017a) study are examined in detail. Furthermore, the overview of learning MWUs, influential factors on learning, and assessment of MWUs are described. Finally, CALL's potential to create English materials and essential features to consider for digital flashcards are reviewed.

Chapter 3 outlines the research methods, explaining the research design, instruments, and procedures for L1 - L2 congruency rating and semantic transparency classification. Next, the outline of creating MWU tests is presented to assess the determining factors of learning MWUs by providing details of MWU test items and scoring procedures, participants' information, data collection, and data analysis.

Chapter 4 consists of the outcomes of data analysis. The first section of the findings provides insight into the primary criterion for selecting useful MWUs for Persian EFL learners. The results provide valuable items that deserve more teaching time. Second, the

chapter presents the results of MWU testing. The relationship between the determining factors of learning MWUs and the collocational knowledge of Persian EFL learners is illustrated. These results provide insight into the specific aspects that warrant consideration.

Chapter 5 provides a comprehensive discussion of the findings. Implications of the present research for teaching and effective ways to enhance collocational knowledge are also explored. This chapter is divided into two sections to address the research questions. The first section discusses RQ1 and RQ2, emphasising how to identify valuable items for teaching directly. In addition, the other section outlines the discussion of the results of the productive knowledge test of MWUs and their determinant factors. Also, the discussion part that follows this chapter's summary looks at how to evaluate and explain the results and if and how the research questions have been addressed. The discussion demonstrates the relationship between these findings and the recent research on processing collocations that leads to becoming prominent in creating custom training material.

Chapter 6, the closing chapter, describes the study's findings and explains the theoretical and pedagogical implications regarding effective collocation learning. It also thoroughly examines the consequences of this thesis and its limitations and outlines recommendations for future research.

1.5 Chapter Summary

This chapter provides an overview of the background, articulates the research problem, outlines the research objectives, and delineates the contributions of this thesis. Additionally, it offers a summary of the contents of the subsequent chapters. This chapter discusses the significance of vocabulary knowledge and explores how it is a crucial prerequisite to learning a foreign language successfully. The study thoroughly explored different aspects of vocabulary knowledge, encompassing both breadth and depth and elucidated their correlation with language proficiency. This chapter emphasised how collocational fluency for L2 learners is essential, as both instructors and researchers concur. However, despite substantial previous research and awareness, collocations are still not given much attention

due to the shortage of a thorough resource representing natural language. The chapter also focused on the importance of collocations as a depth of vocabulary knowledge in language learning, exploring how they are integral to acquiring fluency. This chapter demonstrated the importance of providing a collocations resource by considering influential factors and fundamental criteria to identify items needing greater focus.

The next chapter reviews the previous research and evaluates the literature on collocational research to illustrate gaps and justify the contribution of the present study. Chapter two describes the significance of collocations and provides various approaches to define and identify them. Furthermore, the next chapter overviews collocational research to evaluate influential factors on learning collocations, assessing MWUs, types of learning, and current collocational resources.

CHAPTER TWO REVIEW OF THE LITERATURE

2.1 Introduction

The past few decades have seen much interest in teaching and learning collocations/MWU in the context of SLA and lexical competence research. This specialised focus underscores understanding how words combine to form meaningful phrases, which is crucial for fluent language use. While collocations/ MWUs have been a specific area of interest, it is essential to note that the broader field of vocabulary research has also experienced significant growth. Beyond their role as essential components in language production and comprehension, MWUs are pivotal indicators for evaluating learners' L2 proficiency. Mastery of collocation is a fundamental requirement for fluency and is regarded as a cornerstone of high-level communication. This chapter not only explores various methods and approaches that underscore the paramount importance of collocations, with a notable nod to the influential Lexical Approach (Lewis, 1993), but also delves into how these methodologies contribute to bolstering learners' accuracy and nurturing fluency, an indispensable facet of language acquisition.

Furthermore, this chapter briefly outlines the correlation between vocabulary and collocational research. Examining previous SLA approaches reveals the intricate nature of collocational knowledge and elucidates the predominant approach. This chapter also presents a different way to count MWUs and explains the Lemmatised Concgram Method (LCM). It unpacks the significance of contrastive analysis, L1 - L2 congruency, semantic transparency, and frequency in developing materials tailored for English learners.

Ultimately, this chapter discusses using corpus and concordance programs to identify MWUs and develop materials, as well as the different evaluation criteria for selecting collocations. It also reviews the benefits and drawbacks of using technology in vocabulary learning and suggests various strategies for integrating technology in language classrooms. This investigation explores the significant correlation between Computer-Assisted Language

Learning (CALL) and the development of materials for MWUs, illuminating the pivotal role of technology and digital resources in fostering vocabulary acquisition.

2.2 Theoretical Background on Vocabulary Learning

Research interest in learning and teaching vocabulary has significantly increased in recent years. According to Nation (2022), it is noteworthy that over the past century, 30% of all vocabulary research has been carried out since 2001. This indicates a surge in research activity and recognition of the importance of vocabulary knowledge in language acquisition and teaching. The recent increase in research includes various aspects of vocabulary, such as MWUs, reflecting a broader trend towards understanding and enhancing vocabulary learning and teaching practices. The centrality of vocabulary knowledge spans both L1 and L2 acquisition, positioning itself as a fundamental prerequisite for successfully mastering a foreign language (Qian & Lin, 2020; Schmitt et al., 2015; Webb & Nation, 2017). Vocabulary knowledge is an essential aspect of both L1 and L2 (Webb & Nation, 2017) and a crucial prerequisite to learning a foreign language successfully (Qian & Lin, 2020; Schmitt et al., 2015). Also, developing other aspects of language (such as morphology, phonology, pragmatics, and syntax) begins with vocabulary knowledge (Biber & Conrad, 2001; Green & Lambert, 2018).

Traditionally, the landscape of SLA research and theories emphasised lexical knowledge less than other facets of language. For example, the *Grammar-Translation Method* (GTM) exemplified this trend, where explicit teaching of grammar rules took precedence (Omar, 2019). The GTM method involves translating sentences between the learner's L1 and the target language/second language (L2). In response to the GTM, the *Direct Method*, also known as the *Natural Method*, emerged (Brown & Lee, 2015). This method aimed to shift the focus from explicit grammar instruction to an inductive discovery of grammar, encouraging learners to use the target language for everyday communication within the classroom.

As the importance of everyday communication took centre stage in language learning goals, the *Communicative Language Teaching* (CLT) method surfaced, representing a paradigm shift. CLT prioritises interaction over strict adherence to grammar and vocabulary. Advocates of CLT, including scholars like Lewis (1993), proposed a lexical syllabus aligned with the principles of CLT (Larsen-Freeman & Anderson, 2013). This signalled a shift from traditional methods, recognising the crucial role of vocabulary in promoting effective communication. Consequently, the evolution from the GTM to the CLT method reflects a broader shift in language education paradigms (Larsen-Freeman & Anderson, 2013). The acknowledgement of lexical knowledge as a crucial component underscores the dynamic nature of language acquisition methodologies, moving beyond mere grammar-centric methods to embrace the interconnected elements of vocabulary and communication.

In this regard, "knowing a word" (Nation, 2013, p. 44) is a multifaceted concept encompassing both breadth and depth of vocabulary knowledge (Anderson & Freebody, 1981; Nation, 2001). Breadth, often denoted by vocabulary size, establishes a connection between the form and meaning of words. Simultaneously, depth encompasses nuanced aspects such as collocations, broadening the spectrum of vocabulary knowledge. Researchers assert that the size and depth of vocabulary knowledge serve as robust predictors of language proficiency (Qian & Lin, 2020; Zareva et al., 2005). While previous research predominantly focused on breadth of vocabulary knowledge, the last two decades have witnessed a burgeoning interest in exploring depth of vocabulary knowledge (Webb, 2020b).

In another view, knowing a word includes familiarity with its semantics and collocates (thus forming MWUs). Therefore, it is essential to emphasise vocabulary when teaching language since "a language consists of grammaticalised lexis, not lexicalised grammar" (Lewis, 1993, p. vi). Hence, Lewis (1993) identified "grammaticalised lexis" as an integral part of acquiring fluency in a language. Grammaticalised lexis involves knowing what words are associated with other words. Single-word studies have previously dominated vocabulary research (Pellicer-Sánchez, 2020). However, recent attention in lexicon research has shifted

towards exploring word combinations and collocations as essential components of depth of knowledge.

The paradigm shift towards vocabulary in language research has prompted some scholars to assert that the essence of communication lies in word combinations or MWUs instead of focusing solely on individual words (Cowie, 1992). In the 1990s, with the Lexical Approach (Lewis, 1993), much attention was paid to collocations in L2 learning for successful communication. Nesselhauf (2003) further noted that using collocations is especially important for learners striving for high proficiency in L2. However, they are also important for learners with less ambitious goals, as they improve accuracy and fluency. Therefore, collocations enhance accuracy and fluency, transcending the boundaries of language proficiency aspirations. This recognition underscores the pivotal role that word combinations play in the tapestry of effective language communication. Furthermore, this perspective advocates for a more holistic method beyond isolated words and delves into the dynamic interplay of lexical elements.

On the other hand, the purpose of different approaches is to address the needs of learners in teaching new skills, and all of them have advantages and disadvantages. The selection of a particular method or combination of methods depends on the purpose of learning based on needs analysis (NA) (see Barghamadi, 2020). Since the current study focuses on the MWUs / collocations for Persian learners, it follows the *Lexical Approach* by Lewis (1993). Lewis (1993, p. vi) states that "language consists of grammaticalised lexis; as such, the lexis is fundamental in generating meaning, and grammar plays a secondary role in handling meaning. This approach suggests that competence and communication capacity are accomplished by expanding the learners' knowledge of lexical phrases, understanding collocations, and mastering the most fundamental words and language structure (Lewis, 1993). By adopting this approach, the study not only emphasises the crucial role of lexical elements in language learning but also enlightens us about the potency of words and their combinations in fostering meaningful communication.

In Lewis's Lexical Approach, special attention is directed to collocations, and terms are presented to the learner in familiar chunks instead of isolated vocabulary. Language learning is directly related to the capacity for producing chunks (Larsen-Freeman & Anderson, 2013). From the Lexical Approach point of view, much consideration was given to vocabulary as a critical component of successful communication in L2 acquisition (Beltrán et al., 2010). This approach mainly focuses on different types of MWUs, exercises based on L1 and L2 with translation and comparison, using the dictionary and the notebook.

Based on the Lexical approach, the ability to comprehend and create lexical phrases as prefabricated language chunks is a fundamental feature of language acquisition. The knowledge of chunks is not determined by logic or frequency due to arbitrary co-occurrence, and thus, the learner will acquire reliable resources for learning lexical phrases. As such, MWUs are included in the Common European Framework of Reference (CEFR) as an essential tool for describing learners' proficiency in writing and speaking (Council of Europe, 2001, 2018). This inclusion could also highlight the importance of learning chunks.

Unlike the GTM, which is based on the intra-lingual strategy that keeps L1 and L2 separate, the Direct Method and CLT focus on immersive learning and communication in the target language (L2). In contrast, Stern's (1992) *post-method* is based on a cross-lingual strategy that suggests that L2 is obtained through the use of L1 and encourages teachers to use L1 according to the level of students in the class. Also, in Stern's post-method, the "L1 - L2 connection is an indisputable fact of life" (Stern, 1992, p. 282). Therefore, using the L1 could support learners in learning more MWUs that are difficult to explain. However, a few studies emphasise the role of L1 in identifying and selecting high-frequent MWUs that deserve to be taught and studied directly (see Rogers, 2017a for more details).

Consequently, the present research follows the post-method and the Lexical Approach.

The 1990s witnessed a focus on vocabulary and chunks and the emergence of technology and computer software, giving rise to corpus and digital material formats. Technological advancements have played a pivotal role in identifying MWUs and developing materials. Hence, it offers syllabus designers the tools to leverage computers and software

packages, including concordance programs (Manning & Schutze, 1999). Integrating technology, intuition, and teaching experience empowers educators to create materials that resonate with contemporary language learning needs. Current dictionaries, exemplified by the *Oxford Collocations Dictionary* (McIntosh et al., 2009), focus on collocations and provide valuable information on frequency, word patterns, registers, and grammatical aspects. However, questions persist about the fundamental criteria for selecting collocations and the determinants influencing their learning.

Accordingly, the need for further research in these areas remains apparent, urging teachers and course designers to stay abreast of the evolving landscape of word knowledge. Therefore, the current thesis research takes inspiration from Rogers's (2017a) work to examine the role of L1 - L2 congruency and semantic transparency in identifying MWUs worthy of direct study and instruction based on LCM as a modern approach to identifying such items.

2.3 The Significance of Collocations

Tracing the trajectory of collocational research over the past and present unveils the paramount role that collocations play in the journey of L2 learners. Evaluating the literature review and aligning with perspectives echoed in numerous scholarly works, the significance of studying collocations becomes evident when we embrace two renowned statements: "You shall know a word by the company it keeps!" (Firth, 1957, p. 179) and "the lexical unit is best described maximally, not minimally" (Sinclair, 2004, p. 281). Firth's assertion underscores the dynamic nature of word knowledge, emphasising that understanding a word extends beyond its individuality and hinges on the relationships it forms with other words. This notion aligns with Sinclair's perspective, suggesting that a comprehensive description of a lexical unit should be maximal, encompassing the rich tapestry of associations it weaves.

Generally, *collocation* is defined as "two or more words that tend to occur together" (Conzett, 2000, p. 73). Nesselhauf (2005, p. 25) notes that collocation is not limited to just two lexical elements (e.g., *Put+ pressure*), as other items that are closely related to them

can also be included (e.g., *Put pressure on somebody*). Therefore, the knowledge of only which lexical items collocate is insufficient for learners. The significance of acquiring knowledge of collocations becomes all the more apparent when it is recognised as a "prerequisite for proficiency" (Shin & Chon, 2019, p. 608), a "decisive factor in developing fluency" (Almela & Sánchez, 2007, p. 37), and ultimately, "a key factor of naturalness" (Hoey, 2005, p. 2). Given the significant impact of collocations on language acquisition and proficiency, corpus studies and psycholinguistic researchers are naturally inclined and motivated to investigate the nature and use of collocations.

The value of collocational knowledge for L2 learners became prominent when corpus studies found that a significant percentage of spoken and written discourse consisted of prefabricated chunks (e.g., Erman & Warren, 2000; Jackendoff, 1997; Moon, 1998; Ramisch et al., 2013). Additionally, psycholinguistic evidence shows that adults and children understand and produce MWUs both during language comprehension, where they recognise and process familiar MWUs, and during production, where they spontaneously use MWUs in their speech (e.g., Jolsavi et al., 2013). Since MWUs are the building block of the written and spoken contexts of English L1 speakers to achieve a high level of communication, idiomaticity is recognised as a fundamental factor (e.g., Durrant & Schmitt, 2009; Nation, 2001; Pawley & Syder, 1983; Williams, 2002). More specifically, Pawley and Syder (1983) considered that a large percentage of fluent speech includes "lexicalised sentence stems" and memorised sequences (p. 208). They noted that "by far the largest part of the English speaker's lexicon consists of complex lexical items including several hundred thousand lexicalised sentence stems" (Pawley & Syder, 1983, p. 215). In essence, the recognition of idiomatic expressions and the prevalence of lexicalised sentence stems underscore the role of collocational knowledge in achieving linguistic fluency and communication proficiency. This is a critical aspect for both L1 speakers and L2 learners.

More specifically, in written discourse, Moon (1998) found a high ratio of prefabricated chunks in the *Oxford Hector Pilot Corpus* and *Birmingham Collection of English Text*. Similarly, Erman and Warren (2000) revealed that over 55% of their data

included MWUs. The investigation of the proportion of collocations is broader than written discourse. A significant number of prefabricated phrases were found in an American television show by Jackendoff (1997). Pawley and Syder (1983) and Altenberg (1998) agreed that many MWUs exist in the spoken language corpus. Conklin and Schmitt (2012, p.46) conclude that “one-half of discourse” consists of formulaic languages. This view indicates that both written and spoken languages by native speakers consist of prefabricated chunks. Even spoken language has a more significant proportion of MWUs (P. Foster, 2001).

The evidence presented underscores the reliance of English speakers, as L1 users, on MWUs. This reliance is so prominent that professional performance in writing and speaking depends on control and proficiency in an appropriate range of MWUs for L2 learners (Cowie, 1992). Thus, the significance of collocations for L2 learners is evident in their ability to produce fluent and idiomatic speech. Acquiring knowledge of collocations enhances their communicative competence. However, failing to achieve this level can lead to unnatural language structures, hindering fluent linguistic communication (Men, 2018). In this regard, the strangeness of the expressions produced by L2 learners is not a result of grammatical issues but is related to the chosen word combinations. Therefore, “knowing what words” can occur with other words aids language usage and leads to fluency (Nation, 2001, p. 136). For instance, understanding the distinction between *fast train* and *quick train* exemplifies the nuanced awareness required to navigate appropriate word combinations and contribute to fluent and idiomatic language use.

In this context, knowledge of collocations leads to high communication production and near L1 English speakers, providing many benefits for L2 learners. First, there is an assumption that the collocations are retrieved from memory as whole units or ‘chunks’ (Boers, 2020; Nation, 2013). This form of storage “contributes to fluency” (Nation, 2020, p. 22) by reducing learners' cognitive effort and making for more efficient language processing (Nation, 2001; Snellings et al., 2002). Regarding this benefit, Boers (2020, p. 143) mentioned that “holistic” retrieval of MWUs is acceptable for fixed expressions that

demonstrate no morphological or syntactic variability, and knowledge of them provides productive fluency (e.g., “*on the other hand, happy birthday; at the end of the day*”).

The debate around storing and processing MWUs takes an exciting turn with the proponents of usage-based theory in recent psycholinguistic research. These scholars argue against attributing a processing advantage to MWUs as holistic units. Instead, they suggest that MWUs may be recorded without assuming that they are held together as a whole and that the entire activation occurs with a more significant increase in usage (Siyanova-Chanturia, 2015). According to this perspective, the human brain is highly attuned to the frequency of exposure. With repeated exposure, patterns in the brain become fixed. In this view, learning collocations allows students to process language more effectively because they do not consider words individually (Hunston & Francis, 2000). While individual words are efficient as singular units in both reception and language production, the efficiency is enhanced when these words are learned and processed as prefabricated chunks. Consequently, efficient comprehension occurs when a passage of text can be understood without paying attention to every word (Hunston & Francis, 2000, p. 270). Thus, prefabricated chunks could allow the listener and speaker to understand each other more efficiently.

In addition, evidence shows that mnemonic repetition, such as alliteration (*green grass, daydream*), is widespread in English lexical chunks that have been suggested to facilitate chunk learning (e.g., Boers & Lindstromberg, 2005; Boers et al., 2014). In other words, MWU contains a word that refers to a “mnemonic hook” (Schmitt, 1997, p. 13). Using a mnemonic hook, learners can often recall the meaning of a word in an MWU that they have forgotten more quickly than when they learn words as isolated vocabulary (Rogers, 2017a, p. 46). Therefore, storing MWUs as singular words or chunks is more accessible and economical (Wray, 2002). However, some researchers have focused on mnemonic methods for learning new words related to single words (e.g., Wyra & Lawson, 2018). In contrast, few studies on collocational learning have specifically examined how mnemonic techniques aid L2 learners in recalling word combinations (e.g., Lindstromberg & Boers, 2008).

The assumption that the storage of MWUs is easier than single words has led scholars to investigate and measure the learning process of both types of lexical items (Alali & Schmitt, 2012; Kasahara, 2010, 2011; Laufer & Girsai, 2008). More specifically, Kasahara's study (2011), focusing on Japanese university students, tested students' ability to remember the meaning of single words and MWUs. The results from immediate and delayed tests indicated that the students were more adept at retaining and retrieving the meanings of MWUs. Similarly, Laufer and Girsai (2008) conducted a study where the scores for collocations in both immediate and delayed tests were higher than those for single words. These findings support the idea that the learning process for MWUs may be more effective than single words. However, it is essential to note that not all studies align with this perspective. For instance, Alali and Schmitt's (2012) research suggested that the process of learning single words and formulaic sequences is similar. This discrepancy in findings underscores the complexity of the relationship between learning single words and MWUs.

Recently, Pellicer-Sánchez (2020, p. 168) investigated the results of different studies to compare the learning of single words and MWUs. The researcher suggests that single words and MWUs can be learned from the same learning approaches, but the differences might appear at the recall level. However, it could be challenging to suggest that learning MWUs is more manageable than learning single words, as both are essential for language acquisition and processing (Christiansen & Chater, 2016; McClelland, 2010). Still, the evidence supports that they are rooted in the same approaches and require consideration in the curriculum. Further, investigating collocation knowledge using eye-tracking demonstrated that formulaic sequences are read more quickly than the non-formulaic equivalent (Sivanova-Chanturia et al., 2011; Underwood et al., 2004).

In another study, Dechert (1983) pointed out that using MWUs makes the spoken output smoother and more fluent for a L1 German learner of English. Even the grammatical test by Jiang and Nekrasova (2007) indicated that grammaticality judgments by various L2 learners (Arabic, Bulgarian, Chinese, Czech, Korean, Polish, and Portuguese) for formulaic items were more accurate and faster than for selected non-formulaic items. Collectively,

these findings emphasise the continuity of learning single words and MWUs, their shared cognitive processes, and the potential benefits of integrating both into language learning strategies and curricula. The observed efficiency in processing formulaic sequences further supports their essential role in the acquisition of fluency and proficiency in language use.

Finally, the goal of L2 learning is communication, and several scholars have noted that learning collocations increase communicative competence (e.g., Nation, 2013; Williams, 2002; Wray, 2000) and provide pragmatic skills (Lewis, 1993, 2000). In this case, Nation (2013, p. 480) mentions that “knowing MWUs” is essential to the purpose of communication. Lewis (1993) argues that “the increasing competence and communication power are achieved by extending the students' repertoire of lexical phrases and collocational power” (p. 48). In addition, many collocations are associated with pragmatic functions such as politeness markers like “*I wonder if you mind*” (Wray, 2000, p. 476) and discourse markers (*let me see now*). In other words, learning collocations like *I wonder if you mind* helps learners navigate politeness in social interactions. It enables them to express requests or seek permission with cultural appropriateness, contributing to effective communication in various contexts. Consequently, the knowledge that is obtained from these devices enhances communicative competence.

In this sense, Lewis (2000) described collocation as “the most powerful force responsible for a text's creation and comprehension” (p. 45). Hence, MWU knowledge plays a central role in L2 learners achieving a high level of communication and making language processing more efficient. Although the importance of collocation in L2 learning is obvious, the literature review sheds light on how these items are challenging, and L2 learners have difficulties in producing these items. Recognising and addressing these challenges in L2 learning can contribute significantly to enhancing learners' proficiency and fluency. Educators can empower their students to wield this “powerful force” (Lewis, 2000, p. 45) more effectively in language production and comprehension by providing targeted instruction and practice in collocation usage.

2.4 Collocation and Previous Approaches

The challenge of defining and recognising collocations is crucial in collocational research. Therefore, a variety of terms are referred to as word combinations: "*expressions, fixed combinations, formula units, formulas, lexical phrases, multiword lexical units (MLU), MWUs, phrases, prefabricated, ready-made utterances, recurrent combinations, word-like units*", and so on (Kjellmer, 1994, p. xi). As Nation (2020) claims, finding a definition of what constitutes a collocation and then adhering to it is the main challenge in researching the topic.

Researchers have used collocation more creatively to imply the general concept of MWUs, thereby adding to its complexity. Collocations should be defined first to define MWU since both have comparable traits depending on the viewpoint. A frequent co-occurrence of words is referred to as a broad and straightforward definition of collocations. In this regard, Sinclair (1991, p. 170) pointed out that collocation is "the occurrence of two or more words within a short space of each other in the text". As a narrow definition, collocations or word combinations refer to a syntagmatic relationship in a language, which could be "restricted to relationships which conform to certain syntactic and semantic criteria" (Wood, 2020, p. 31). How collocations are handled varies from MWU, depending on the approach used. Two dominant approaches in collocational research have attempted to define this concept: *phraseological and frequency-based approaches*.

In this regard, Palmer (1933) was the first scholar to define collocation as a sequence of two or more words that need to be learned as a whole rather than pieced together from its "constituent elements" (Palmer, 1933, p. i). Palmer's definition is pedagogically oriented and uses non-compositionality as the main criterion. By reviewing Palmer's work, several MWUs can be identified that do not follow this criterion, such as "*thank you*", "*to agree with someone*", and "*in a week*" (Shin, 2007, p. 200). In addition, the definition is unclear: "What kind of co-selecting relationship between two or more words can qualify them as a collocation" (Men, 2018, p. 14). Russian phraseologists Vinogradov and Amosova extended Palmer's work (see Granger & Paquot, 2008). This led to the emerging "*significance-oriented*

approach" (Herbst, 1996, p. 380), "*phraseological approach*" (Nesselhauf, 2004, p. 1), or "*intensional approach*" (Evert, 2004, p. 15). This perspective tends to define collocations as MWUs or a type of word combinations along a continuum, ranging from "the opaque and fixed ones" to "the most transparent and variable ones" (Granger & Paquot, 2008, p. 2), and it takes a narrow perspective of what constitutes a collocation.

Following the phraseological approach, Wolter and Yamashita (2015, p. 1194) noted that at least one word "must be used in a semantically non-transparent" to define collocation in this view. The phraseological perspective (e.g., Howarth, 1998) employs a typological strategy to discover collocations based on grammatical structure and semantic transparency (Gyllstad & Wolter, 2016). For example, *read a letter* is a free combination of literal meanings. However, *read one's mind* is a collocation when one component word appears in its literal sense and the other in its figurative sense.

Therefore, the phraseological approach recognises only "semantic relationships between the constituents" (Henriksen, 2013, p. 31) of MWUs and ignores their frequency. The disadvantage of this approach is that it does not consider the frequency of occurrence while looking for appropriate collocations. As a result, MWUs like *lousy weather* might be selected for direct teaching utilising the phraseological method. However, they might need to occur more frequently to qualify as the most pertinent material to study at a particular stage in the learner's fluency. Since some collocations are uncommon, there may be better and more valuable items for L2 learning and teaching.

Although Palmer was the first one to define collocation, it is represented as a 'Firthian' term (Nation, 2001) that refers to "habitual co-occurrence" (Firth, 1957, p. 181) and includes the concept of 'frequency' in absolute or relative terms. According to the literature, Sinclair and Kjellmer developed the Firthian approach (Evert, 2004; Wood, 2020). These scholars refined and indicated that collocation is a function of a word's frequency in a particular lexical sense relative to its overall frequency in the language (Wood, 2020). The "*frequency-based approach*" (Nesselhauf, 2004, p. 10), "*distributional approach*" (Evert, 2004, p. 15), or "*statistically oriented approach*" (Herbst, 1996, p. 380) are somewhat related

and are in the tradition of the work of Firth. These provided a way for lexical studies in computer-based frequency and corpus-based study of collocations.

As a pioneer of the Firthian approach, Sinclair defines the bottom-up corpus-driven approach instead of the top-down approach based on linguistic criteria to identify phraseological units (Sinclair, 1987, as cited in Gardner & Paquot, 2008). In the next step, Sinclair (1991, p. 170) refers to collocations as "the occurrence of two or more words within a short space of each other in a text" and introduces the "open-choice principle" and the "idiom principle" that are two models of the way words occur in a text. The open-choice principle refers to grammatical structures of words or as "probably the normal way of seeing and describing language" (Sinclair, 1991, p. 109). Based on this model, there are vast choices of lexical items to fill the gap, and the only constraint is grammaticality.

Sinclair (1991) states that words do not appear randomly in a text, and the open-choice principle fails "to account for meaning in language" (Barnbrook, 2009, p. 32). As opposed to the open-choice principle, the idiom principle is characterised by restricted exchangeability, which means "that at least one member of the prefab cannot be replaced with a synonymous item without changing its meaning, function, and/or idiomaticity" (Erman & Warren, 2000, p. 32). Thus, the idiom principle is proposed as a text interpretation framework.

The idiom principle refers to a set of "semi-preconstructed phrases" (Sinclair, 1991, p. 110) and is related to phrases that are prefabricated. Semi-preconstructed is equal to the term 'prefabricated' by Wray (2002). The concept of 'single choices,' as defined by Sinclair, aligns with Wray's characterisation of them as a whole retrieved from memory. According to Siyanova-Chanturia and Martinez (2014, p. 551), these assertions underscore the holistic nature of MWU processing, emphasising the storage and assembly of words in chunks. These two models have become crucial to assessing the knowledge of L2 learners' understanding and collocation production problems in collocational research. Some scholars indicated that English learners use the open-choice principle more (e.g., Granger, 2002;

Laufer & Waldman, 2011; Men, 2018). These results may indicate that L2 learners need more collocational knowledge and issues in collocation production.

Besides defining *collocations* as co-occurring words, some scholars have added statistically significant co-occurrences or frequency criteria to determine collocations (e.g., Hoey, 2005; Moon, 1998). The frequency-based definition of collocation typically shows repeated or statistically significant co-occurrence, whether or not there are any particular semantic relations between collocating elements (Moon, 1998, p. 26). Since the benchmark frequency is insufficient, some scholars add a grammatical structure to define and identify collocations (e.g., Kjellmer, 1987; Shin, 2006). Considering grammatical structure and frequency as a criterion to determine MWUs, many items could be found (e.g., *the, of, but, too, et cetera*) that do not have value for learning compared to units such as *make a decision, run into problems*.

Statistical measures, such as mutual information (MI) scores and t-scores, are commonly used to identify word combinations frequently occurring in large language corpora. MI measures the likelihood of one word appearing alongside another when considering their frequency of occurrence in combination compared to random co-occurrences. It uses a "logarithmic scale to express the ratio between the frequency of the collocation and the frequency of random co-occurrences of the two words in the combination" (Gablasova et al., 2017, p. 163). On the other hand, t-scores assess "how certain we can be that the collocation is the result of more than the vagaries of a particular corpus" (Hunston, 2002, p. 72). With frequency taken into consideration, it is more of a measurement of "the certainty of a collocation" (Hunston, 2002, p. 73). There is a tendency to find grammatical functions, such as "*of the*" (Gablasova et al., 2017, p. 163).

MI highlights collocations whose elements frequently co-occur but may not appear with high frequency. For instance, Durrant et al. (2022) noted that MI is highest for rare word combinations commonly co-occurring, such as "*tectonic plate*" (Granger & Bestgen, 2014, p. 230), illustrating the exclusivity of the adjective-noun pairing. Similarly, Rogers (2017a) found that certain combinations like *crux/matter* had shallow co-occurrence frequency but high MI

scores. Despite this, utilising MI alone could result in selecting items with high MI scores that are uncommon combinations. Conversely, the t-score method emphasises collocations of commonly used words, like “*good example*” or “*hard work*” (Granger & Bestgen, 2014, p. 230). However, while some researchers have integrated MI into their frequency-based approaches, others, like Shin (2006), Rogers (2017a), and Rogers et al. (2021), argue that MI alone may not suffice in identifying valuable items. Rogers (2017a) proposed a combined approach using MI and raw frequency data thresholds to address this limitation.

From a simple point of view, in the frequency-based approach, collocations are defined as combinations of two words that commonly appear together, regardless of how semantically transparent they may be (Macis et al., 2021). Low-frequency collocations are less likely to be chosen using this method in L2 learning and teaching. The Firthian approach focuses on linear co-occurrence (Men, 2018). Since collocations consist of four words on each side, it seems insufficient to identify collocations based on this approach (Men, 2018).

On the other hand, the Concgram program by Greaves (2005) can accommodate constituency variation (i.e., AB, ACB) and positional variation (i.e., AB, BA). This searching tool can automatically extract 2 to 5 co-occurring and up to 12 words on the left and right of the origin. The term 'origin' is used for the word or words that form the basis of the automated concgram search instead of node. Furthermore, Wood (2020) notes some significant drawbacks to the frequency-based approach if used with “smaller data sets, mainly because cut-offs of minimum frequency may be very difficult to set” (p. 37). Therefore, using the concgram approach and grabbing large amounts of data, a frequency-based approach could be the best way to identify MWUs.

In summary, the phraseological approach emphasises semantic relationships, while the frequency-based approach utilises corpus analysis to examine the prevalence of MWUs in language usage. The controversial issue with these two perspectives may be identified that some of the word combinations that are categorised as collocations in one study may be considered idioms in another, such as ‘*pull strings*’ in Webb et al.'s (2013) study and ‘*bottom*

line' in Wolter and Gyllstad's (2013) study. Consequently, what may be considered a collocation by one method may not be based on another.

As previously noted, both of these approaches have benefits and drawbacks. According to Berti and Pinnavalua (2012), an integrated approach could mitigate the drawbacks of these two perspectives. While it is relatively common in collocational research, particularly in the study of the learning processes, there is a tendency to choose the frequency-based approach (e.g., Macis et al., 2021; Sonbul et al., 2022). One side of this research aims to provide a resource for high-frequency MWUs when defining collocations without considering the benefits and drawbacks of the phraseological and frequency-based approaches. Therefore, the present study follows the frequency-based approach, which focuses on word co-occurrences and provides a way for lexicon study in the corpus-based and computer-based frequency.

2.5 Definition of Collocations in This Research

In the field of lexicon studies, a comprehensive literature review indicates that scholars have directed their attention towards various dimensions in an effort to define collocations. That included semantically opaque words that frequently co-occur (Moon, 1994), syntactic structures (Gitsaki, 1996; Zhang, 1993), syntactic structures, and frequency (Leśniewska & Witalisz, 2007), and distinguishing collocations from phrasal verbs, prefabricated patterns, and idioms (e.g., Bahns, 1993; Benson et al., 1986; Fellbaum, 2015; Woolard, 2000). For instance, Fellbaum states that idioms, like collocations, differ in how lexically and syntactically fixed they are. In comparison to collocations, which are compositional, idioms are semantically opaque to varying degrees.

Benson et al. (1986, p. 252–253) use the noun *murder* to demonstrate the distinguishing feature of free combination, idioms, and collocations. As a free combination, the noun “*murder*” can be combined with several verbs (“*to analyse, boast of, condemn, discuss, and so on*”) plus *murder*. On the other hand, Idioms are frozen terms with meanings that do not correspond to the meanings of their constituent parts, such as “*to scream blue*

murder “(to complain very loudly). Compared to idioms, fixed combinations or collocations (“*commit murder*”) fall somewhere between idioms and free combinations, and their meanings represent the sense of their constituent parts (Benson et al., 1986, pp. 252–253). It seems that it is difficult to distinguish ‘collocations’ from idioms. Cruse (1986, p. 41) believes in a “transitional area” between collocations and idioms. In contrast, Hill (2000) notes that collocation is idiomatic and “a predictable combination of words”, and both idioms and phrasal verbs are collocations (Hill, 2000, p. 48).

Besides the frequency-based and phraseological approaches as the two dominant approaches in collocational research, scholars have used various terms and criteria to define collocation or MWUs. MWUs and multi-word expressions (MWE) could be the umbrella terms that refer to this endless space (Fellbaum, 2015; Masini, 2019). This variety may indicate that the definition of *collocations* is a challenging task. Nation (2020) states that the most outstanding issue “in dealing with research on collocation is coming up with a definition of what can be considered a collocation and then following that consistently” (Nation, 2020, p. 21). Therefore, terminological issues make conducting research difficult (Wolter, 2020) when there is no agreement and unique definition for MWUs.

In another attempt, scholars utilise the term MWU to include collocations. Fellbaum states that MWUs consist of collocations and idioms. They are “statistically significant co-occurrences of specific lexical items and fall along a sliding scale of syntactic fixedness and semantic non-compositionality” (Fellbaum, 2015, p. 413). Biber et al. (1999) distinguish collocations from MWUs by classifying two-word phrases as collocations and other terms as idioms. Some researchers seem to be proponents of the idea that treating collocations and MWUs as interchangeable has merits (Durrant & Schmitt, 2009; Rogers, 2017a). Defending that collocations and MWUs are the same could simplify linguistic analysis and categorisation. It might streamline research methodologies and promote a more unified approach to studying these linguistic phenomena. Additionally, it could lead to a more inclusive understanding of the complexity and variability within multi-word expressions, acknowledging that distinctions between collocations and idioms are not always clear-cut.

This could facilitate a more nuanced exploration of language use and contribute to a more comprehensive linguistic framework.

From a new perspective, the lemmatised concgram method (LCM) defines collocations and MWUs as one phenomenon (Rogers, 2017a). Concgramming (Cheng et al., 2006) counts co-occurrence by counting all the inflected forms of pivot words with the same part of speech (a lemma) with a frequently co-occurring collocate (also in lemma form). This method can account for constituency variation (AB, ACB) and positional variation (AB, BA) and therefore counts structures such as *this study found*, *studies find*, and *finding a study* together for the lemma pair *study/find*. Consequently, similar items are counted together, leading to more precise frequency counts. The words that make up a concgram can explain different combinations. Several researchers say this method best identifies MWUs (Cheng et al., 2006; Rogers, 2017a; Rogers et al., 2021).

The evidence indicates the absence of a universal definition for this concept. Although various collocation definitions exist, collocational fluency is a significant achievement for L2 learners (Almela & Sánchez, 2007). Rogers (2019) states that collocations and MWUs could be defined as the same through the concgramming approach if the research goal is to “produce a resource to be studied that has little redundancy and accurate frequency counts” (Rogers, 2019, p. 150).

In the current research, the frequency of co-occurrence (Biber et al., 1999) as a traditional view and lemmatised concgrams (Rogers, 2017a) as a modern perspective are combined to define collocations or MWUs as a single entity to produce a resource for teaching collocations. From this point of view, this study treats each MWU as the same, regardless of whether it is an idiom or a phrasal verb. Based on this view, MWUs are collocations from transparency to non-transparency. Therefore, describing lemma, type, and word families is essential to clarify the lemmatised concgram method and counting collocations.

2.6 Counting Collocations

Given the vast number of items in a target language, attempting to teach or learn all words becomes impractical. Consequently, decisions must be strategic, prioritising specific learning goals. Martelli (2006) claimed that selecting word combinations to be taught is one of the most challenging aspects of dealing with these items. In other words, the purpose for which a word is taught or learned will determine the best way to select it. Therefore, several word lists have been developed by using corpora (e.g., Rogers et al., 2021). Corpora are a fundamental collection of spoken and written data recorded electronically. List developers can depend on data from broad and representative sets that represent actual language use to predict expressions L2 learners will likely confront in future language use. Hence, corpora are reliable (T. Dang, 2020) for selecting high-frequency items.

There are few high-frequency words, but they account for a significant part of the words in different textual forms. Therefore, the starting point for creating a list of single and MWU items is to select high-frequency words from corpora often recommended to acquire L2 vocabulary learning since learning these terms could give L2 learners an excellent opportunity to comprehend a target language (Vilkaitė-Lozdienė & Schmitt, 2020). Undoubtedly, all existing lists are systematically compiled and encompass high-frequency words. The *New General Service List* (NGSL) by Brezina and Gablasova (2015) and the *Academic Vocabulary List* (AVL) by Gardner and Davies (2013) are designed to cover high-frequency words useful for general and academic English. Similarly, the *Phrase List* by Martinez and Schmitt (2012) provides high-frequency phrases essential for learners.

Despite this, researchers reported that frequency alone is not the best criterion for those learning L2 (e.g., Shin, 2006). The simple definition of collocations is the frequency of co-occurrence. Therefore, combinations such as *of the*, *in the*, *to the*, *on the*, and so on should be counted as collocations with this definition, in addition to *make a decision*. However, Shin (2006) noted that collocations need to be meaningful units and grammatically well-formed. Also, some researchers pointed out that one method as a solution is to consider content words (nouns, verbs, adjectives, adverbs) as collocations (e.g., Ackermann & Chen,

2013; Woolard, 2000). Biber et al. (1999) distinguish collocations from MWUs by classifying two-word phrases as collocations and other expressions as idioms.

Simultaneously, researchers like Conzett (2000) define collocation as "two or more words that tend to occur together," underlining the inherent association between these lexical elements. However, Nesselhauf (2005) provides a broader perspective, asserting that collocation extends beyond mere pairs of words. For instance, it encompasses explicit two-word combinations (e.g., "*put+ pressure*") and other elements closely linked to them (e.g., "*put pressure on somebody*") (Nesselhauf, 2005, p. 25). This inclusive approach challenges the limitations imposed by restricting collocations to strictly two-word expressions and acknowledges these linguistic associations' dynamic and varied nature. Consequently, collocations research still needs to discuss selecting valuable and high-frequency items from corpora for the teaching and learning process. Counting collocations is a critical issue in searching for and providing resources, and Nation (2016) noted that the results of collocation studies rely on counting them. Concerning collocation research, there is a question of debate in corpus studies on how to count them, whether by *word type*, *word family*, or *lemma*.

Using *word type* to calculate collocations is the simplest method (Rogers et al., 2014). In this sense, *walk*, *walks*, *walking*, and *walked* are different pivot words counted separately. Therefore, words with different spellings are counted separately with no attempt to consolidate data. Since there might be hundreds of thousands of collocations in a language (Pawley & Syder, 1983), data must be reduced in some way if the aim is to find collocations deserving of direct teaching. Considering the limitation of students' time, using word type to count collocations may not benefit them.

Another way to count MWUs is a *word family*. It refers to a stem (the headword) plus all affixed forms that are closely related (Coxhead, 2000, p. 218), and affix consists of "all inflexions and as well as the most common, productive, and frequent prefixes and suffixes" (Bauer & Nation, 1993, p. 255). However, there is an assumption that if the students know a headword, they have information about the rest of the word family (Webb & Nation, 2008). In contrast, González Fernández and Schmitt (2019) reported that the learners in their study

could produce two to three forms of words when asked to provide derivational forms of all four-word classes, not all the derivations. Gardner and Davies (2014, p. 307) state that the word family has significant issues. First, putting a word in the same family with substantial differences in meaning, for example, *react* as a verb (meaning respond) and *reactor* as a noun (associated with nuclear power) are in the same word family. Second, grammatical parts of speech do not count. For example, the verb *proceeds* (which means continues) and the noun *proceeds* (which means profits) are counted as part of the same word family.

In another view, Vilkaitė-Lozdienė and Schmitt (2020, p. 84) point out that technical and pedagogical issues will occur when word lists are based on word families. Technical issues demonstrated that automatically computing lists by word families is more complicated than lemmas. Regarding pedagogical views, teachers and learners might misunderstand when using word lists. Also, Vilkaitė-Lozdienė and Schmitt (2020) concluded that while word families are valid for receptive knowledge targets, they may be unreliable in all contexts. Therefore, counting words by word families could not be correct for selecting high-frequency words or collocations because the headwords may not be the most frequent lexical item (Vilkaitė-Lozdienė & Schmitt, 2020). Another issue is that word families include inflectional and derivational terms. While inflectional terms are relatively easy to learn, derivational terms are more complicated and particularly challenging for low-level learners.

Regarding the disadvantages of word type and word family, some researchers utilised *lemma* to eliminate these weaknesses for counting. Lemma is a group of similar words with the same stem and inflected configuration belonging to the same part of speech (Nation & Meara, 2002, p. 36). For example, *house* as a noun and *house* as a verb are counted separately, but *walk*, *walks*, *walking*, and *walked* are all counted together, but *walk* as a noun is different. Vilkaite-Lozdiene and Schmitt (2020, p. 85) stated that there was no “an arbitrary decision on what to classify as the same lemma needs to be made”. They argue that opting for lemmas simplifies word counting, making it more user-friendly for learners who need not reach an advanced level. Despite its advantages, lemmatisation is not flawless. One issue involves grappling with irregular word forms such as “*mice, is, best*”

(Nation, 2001, p. 9). Another hurdle is choosing the base or recurring lemma form as the headword (Sinclair, 1991). The lemma method has its perks, but like any approach, it comes with its own challenges.

This research is dedicated to identifying high-frequency MWUs, following in the footsteps of Rogers's (2017a) work. By overcoming the limitations of word type and word family, lemmatisation can reduce the number of items in the corpus and consolidate data. For instance, Gardner and Davies (2014) used lemmas to create an *Academic Vocabulary List* (AVL). Building on this, Rogers (2017a) and Rogers et al. (2021) combined lemmatised pivot words and a concgramming approach to provide general and academic MWUs resources, respectively. A pivot word (or node) is the focal word in a collocation (Shin, 2007). Shin (2007) and Rogers et al. (2021) consider pivot words to define collocations. For example, by searching for the word *eat* as a pivot word, the word *lunch* may be found as a collocater. Conversely, *break* could emerge as a collocater when researchers search for *lunch* as a pivot word. This process is akin to solving a linguistic puzzle. Each pivot word reveals a unique set of collocates, offering a nuanced perspective on word associations. Lemmatisation, therefore, plays a crucial role in this process, making it an exciting area of research in corpus linguistics and vocabulary acquisition.

Considering that only pivot and collocater words as an isolated pair is insufficient to provide a resource for teaching collocations. Exposing learners to only the pivot and collocater (e.g., *make + decision*) is inadequate, and teachers need to support learners to produce the whole structure (e.g., *make a decision*). Therefore, in the current research, *collocations* are operationally defined as lemmatised concgrams. It departs from the traditional approach based upon the frequency of co-occurrence (Biber et al., 1999) because the frequency and mutual information corpus data are used to search for collocations using high-frequency pivot words and collocates that could be a noun, verb, adjective, and adverb. Whether or not MWUs are phrasal verbs or idioms, et cetera, is not a deciding factor and collocations or MWUs are treated as a single item in this study.

Even for both English as L1 speakers and teachers, it is difficult to realise which MWUs are the most common formulaic chunk (Rogers, 2018). Therefore, it is essential to develop sufficient materials to identify the most common formulaic chunks. In the current research, the list of MWUs created by Rogers (2017a) has been used to provide a resource for Persian learners. As mentioned, counting collocation based on the lemma would be a valuable identification method Rogers used to select the high-frequency items in his list.

2.7 Identification of MWUs and Concgramming Method

It is worth noting that acquiring a new language can be challenging. Nonetheless, some expressions commonly used by L1 English speakers can significantly enhance L2 learners' ability to sound more natural and fluent. These fixed phrases, such as *How are you?* and *Nice to meet you*, can make a remarkable difference in language proficiency. L2 learners can effectively improve their communication skills by committing these phrases to memory and utilising them in the appropriate context. Despite its seemingly minor nature, this approach can significantly boost L2 learners' confidence when communicating in a foreign language. However, this raises the question of identifying these word combinations or sequences for teaching and the L2 learning process. As stated earlier, it is evident that simply classifying words as categories and providing students with lists of words to study is not optimal. Such a technique does not produce a co-occurrence count accurately representing the natural language.

In this regard, frequency analysis and statistical measures of co-occurrence may be used to find MWUs in corpora. Also, expert or L1 English speaker judgment is potentially beneficial for identifying those items; it is conducive when used on small data sets. In many situations, absolute assurance in identification can be challenging, even though employing a mix of measurements is frequently ideal. Advances in corpus analysis technologies and techniques have enabled the discovery of MWUs, but establishing orthodoxy over time can be troublesome. In response, a computer-based frequency analysis of collocations became available; however, there are some limitations.

Researchers in the Natural Language Processing (NLP), Computational and Corpus Linguistics fields are familiar with n-gram, a specific sequence or linear sequences of any number (n) of words to find MWUs. This method is only helpful for searching collocations that follow in line (Cheng et al., 2006). In reality, collocations that occur in non-contiguous sequences (i.e., AB, ACB) and, therefore, many word combinations may still need to be discovered. To clarify, the researcher using n-grams may find the phrases like *many people, lose weight*, but the patterns such as *a lot of different people, lose some weight* would be undiscovered.

The limitation of n-grams has led to the development of Skipgram searches in NLP (Wilks, 2005) to discover non-contiguous word associations and handle constituency variation. In this approach, *make money* and *make some money* should be counted together due to constituency variation. Skipgram, while a valuable tool, does have its constraints. One drawback is its reliance on 3-word skip grams, limiting its ability to handle positional variations like AB or BA (Cheng et al., 2006). This means it might miss out on identifying MWUs that are more than four words apart.

The limitation of n-grams and Skipgram search engines led to the concgram program by Greaves (2005). A concgram "constitutes all the permutations of the constituency and positional variation generated by the association of two or more words" (Cheng et al., 2006, p. 411). Cheng et al. showed that a concgram measures collocations and sorts them by frequency of contiguous and non-contiguous collocation patterns. The "*constituency*" (Cheng et al., 2006, p. 413) refers to one or more terms between the related words (AB, ACB, e.g., *make money, make some money*). "*Positional variation*" (Cheng et al., 2006, p. 413) refers to related words that appear relative in various positions (AB, BA, e.g., *world city of Asia, Asia's world city*). This search can automatically extract 2 to 5 co-occurring and 12 words on both sides of the origin. Thus, a concgram's associated words are the source of various collocations.

The COBUILD group at the University of Birmingham used computer software in the 1980s to find non-contiguous word sequences in corpora for the first time (Wood, 2020).

Multiple scholars acknowledge that concgramming is an effective method for MWU identifications and facilitates learning (e.g., Cheng, 2007; Cheng et al., 2006; Durrant, 2009; Rogers, 2019; Rogers et al., 2021). For instance, Cheng et al. (2006) state that using concgram provides a facility to understand Sinclair's (1991) idiom principle and could help "to raise learners' awareness" (Cheng, 2007, p. 294) of this principle to discover chunks. Since concgrams are a source of raw data by speakers and writers to reveal the co-selections in the corpus, they help identify meaningful word associations. Furthermore, Rogers (2017a, p. 28) points out that the results do "not accurately reflect natural language" for identifying MWUs without a concgram search. Table 1 illustrates a sample of searching via this method in Rogers's (2017a) study.

However, merely recognising lemma pairings that co-occur frequently is inadequate to provide learners with relevant material to study. Despite the advantage of concgram, it needs to be improved in identifying the lemma collection that sometimes co-occurs to provide learners with unique items to consider. This goal is accomplished via concordance software, such as AntConc (Anthony, 2011), to identify MWU's most representative lemma pair. The top three MWUs for this lemma combination provided *support* (55), *support provided* (39), and *support provided by* (32) after 500 examples of sentences from the COCA with both the lemma *provide* and *support* were evaluated using AntConc. Therefore, the result revealed that *provide support* was the most frequent MWU.

Table 1

An Example of a Concgram Search from the COCA for the Lemma 'Provide' and 'Support' (in Data from Rogers, 2017a, p. 26)

...low-cost measures, the United States can extend the same lifesaving **support** that it has **provided** to the little boy in a rural, dusty village to the working-age woman living...

...it, then provide technical support to assist them. This support can usually be provided through a single phone call or demonstration. If needed, seek assistance from school...

...losing those aid dollars that we need in order to get **support** when Pakistan does **provide** it,

which is real and does help us in the case of drones to...

...for low-income adults in occupational programs as well as financial **support** to colleges to **provide** support services for such students. States and colleges interested in adopting a model similar...

Note. It is adapted with Permission from Rogers's (2017a) research.

However, the software would produce much noise in each set that must be removed manually. Rogers (2017a) used AntWordPairs (Anthony, 2013), custom software designed specifically for his study, which led to an innovative lemmatised concgram approach/method (LCM) to identify the most representative MWUs. Rogers (2017a) developed a unique technique to find exemplary MWUs from lemmatised concgram data and expand the concgramming method: First, concordance data from a corpus was gathered using frequency and mutual information cut-offs for high-frequency co-occurring lemma. In Rogers's (2017a) initial data set, for instance, *come* and *term* often co-occurred (see Table 2). Any data that had the core unit (*come to terms*) and happened 50% or more of the time were considered to select the data's exemplary MWU.

Table 2

MWUs Identified from 500 Example Sentences in Which the Lemma Pair 'Come' and 'Term' Both Occur in Rogers's (2017a, p. 29) Data

MWU	Occurrences in 500 sentences
<i>come to terms</i>	243
<i>come to terms with</i>	229
<i>to come to terms</i>	133
<i>to come to terms with</i>	129
<i>coming to terms</i>	96
<i>coming to terms with the</i>	86
<i>to come to terms with the</i>	44
<i>come to terms with</i> [pre-nominal possessive pronoun]	28
<i>coming to terms with the</i>	26

The exact process determines whether the component could be expanded further. As shown in Table 2 above, *coming to terms with* does more than include the core unit; it also

follows the core unit more frequently than 50% of the time by *with* (229 times out of 243 occurrences). Additionally, the data shows that this new example happens *to come to terms with* 129 times out of 229 instances, or more than 50% of the time. Nevertheless, because the next extension (*to come to terms with the*) only happens 44 times out of 129 times as often as the present exemplar, the extending stops then, and *to come to terms with* counts as the exemplary.

In the practical circumstances, Rogers et al. (2021, p. 146) explain that concgrams are more accurate in identifying MWUs of two co-occurring lemmas, enabling data consolidation and removing duplicated items. They demonstrate that "*Take a break*" is a typical combination of the verb "*take*" and the noun "*break*", and they can appear as "*take breaks, taking breaks, took a break*", et cetera since they are derived on the same MWUs categorised as a single item in concgramming (Rogers et al., 2021, p. 146). Based on Rogers's (2017a) research, this novel method has clear advantages compared to previous methods of identifying collocations/MWUs. Hence, this definition of collocation/MWU is used in this study since it aims to develop a similar large-scale resource for Persian-speaking English learners.

2.8 Lack of Collocational Fluency and Related Issues

Data from several studies suggest that collocational knowledge is a substantial factor in gaining a "marker of proficiency" (Meunier, 2012, p. 112) and a sign of "a foreign accent" (Waller, 1993, p. 224). Despite the significance of collocations, research has shown that learning collocations is the most challenging component of learning and teaching English in various circumstances. Various studies examining diverse student populations, including German (Bahns & Eldaw, 1993; Nesselhauf, 2003), Iranian (Davoudi & Behshad, 2015; Keshavarz & Salimi, 2007), Japanese (Rogers, 2013), Jordanian (Fayez-Hussein, 1990), Polish (Biskup, 1992), Spanish (Jaén, 2007), and Taiwanese (Lin et al., 2003; E. Liu & Shaw, 2001), consistently report a prevalent lack of collocational knowledge among learners. More specially, the results of Fayez-Hussein (1990) showed that approximately half of

Jordanian students majoring in English who were tested on their collocational knowledge failed the test. This collective body of research underscores the universal and persistent nature of the challenges associated with mastering collocations in diverse linguistic and educational contexts.

Examining the collocation performance among L2 learners demonstrated that the most challenging aspect of collocational knowledge for advanced learners is the degree of restriction (Howarth, 1998; Keshavarz & Salimi, 2007; Nesselhauf, 2003, 2005). For example, Nesselhauf (2003, p. 233) indicated that the lowest rate of errors occurred with more restricted collocations, such as "*pay attention*" and "*run a risk*", due to learners' awareness of the restriction in combinations. These kinds of verbs combine with a few nouns and produce as a whole. In contrast, less restricted combinations are prone to errors when verbs such as "*exert*" and "*reach*" take a variety of nouns (Nesselhauf, 2003, p. 233).

Considering the production of collocations, L2 learners often tend to deviate from the norm and use a fewer number of them compared to their L1 English counterparts (e.g., Cobb, 2003; Durrant & Schmitt, 2009; Laufer & Waldman, 2011; Nesselhauf, 2005). According to Laufer and Waldman (2011), fewer verb-noun collocations are generated by L2 learners than by L1 English speakers. Martelli (2006) collected 30 essays from Italian advanced English learners. The research reported that out of 105 collocations, errors consisted of adverb + verb (0), adjective + noun (50), verb + noun (45), and the rest of the entire word combinations. The researcher observed that in instances where there is an absence of verb + adverb combinations, it suggests a hesitancy among students to seamlessly pair verbs with adverbs, possibly leading them to adopt an avoidance strategy in expressing these particular concepts. Nesselhauf (2005) stated that selecting the correct verb could be a challenge for L2 learners when she reported that one-third of the verb+ noun collocations by L1 German-speaking learners were unacceptable.

Among the characteristics of L2 learners that differentiate them from L1 English speakers is their limited availability of prefabricated chunks (Cobb, 2003). Additionally, they tend to rely heavily on specific word elements within compounds, akin to what is described

as "collocational teddy bears" (Nesselhauf, 2005, p. 69), "safe bets" (Granger, 1998, p. 148), and "islands of reliability" (Dechert, 1983, p. 184). Also, the morphological differences between languages may be another reason to avoid using collocations or making errors due to L1 influence. E. Liu and Shaw's (2001) study identified the morphological differences between Chinese and English. They explained that a rule of inversion in English leads to the formulation of *film-making* from *making a film*. There are no inversions in Chinese, and learners can avoid using unfamiliar structures. Consequently, learners tend to overuse collocations that they are familiar with while avoiding those they are unsure how to use. In other words, their concern could be that they do not want to risk using unfamiliar L2 combinations.

Moreover, the synonym strategy is another reason for collocation errors. Farghal and Obeidat (1995) found that Arabic EFL students used the open-choice principle and synonym strategy to select a word. It could be accepted that L2 learners tend to join words with semantic compatibility. On the other hand, semantic compatibility does not produce an acceptable collocate. For example, "the word *several* is a synonym of *many*, but *several thanks* are unacceptable while *many thanks* are acceptable" (Fayez-Hussein, 1990, p. 123).

For instance, while *strong*, *powerful*, *intense*, and *vigorous* are synonyms, only *strong* collocates naturally with *coffee* (Pearce, 2001, 2002). In the Iranian context, Davoudi and Behshad (2015) found that 35.1% of their participants were based on a synonym strategy, such as *looking for money* (earning money) and *building an impression* (making an impression). Webb and Kagimoto's (2011) study revealed that the synonym strategy could improve vocabulary learning but negatively affected collocation learning. Therefore, substituting a synonym for a word could indicate that the learners are unaware of the collocational restrictions between lexical items.

Traditionally, the cross-language perspective has been the main reason for avoiding the use or inappropriate production of word combinations among learners in areas where the difference between L1 and L2 is challenging for L2 learners (Dagut & Laufer, 1985; Kleinmann, 1978; Laufer & Eliasson, 1993). In this regard, Laufer and Eliasson (1993) found

that Swedish learners avoid using phrasal verbs due to L1 - L2 incongruence. Dagut and Laufer (1985) also note that Hebrew English learners prefer to use one-word verbs and avoid phrasal verbs; "such avoidance can be realised by inter-lingual approach" (p.78). As mentioned above, there is evidence that the repetition, synonym, and avoidance strategies cause problems with collocational learning in L2 English. In addition, it is well known that the first language or L1 interference plays a significant role in collocational errors, and several studies claimed that L1 interference has a negative effect on producing collocations in another language (e.g., Bahns & Eldaw, 1993; Biskup, 1992; Farghal & Obeidat, 1995).

Considering collocation learning, where there is the exact correspondence between L1 and L2 in both languages, transfer from the L1 of learners to the target language can lead to positive production and satisfaction (R. Ellis, 2008). For instance, a study by Granger (1998) indicated that L2 learners tend to use direct L1 equivalents more often than native-like expressions. However, word-for-word translation in most languages could have a high potential for error due to the cross-linguistics relationship. Since the past research in collocations focused on finding collocational mistakes in the last two decades, an evaluation of recent studies reported that the similarity between L1 and L2 is one of the significant determinants of collocation knowledge (e.g., Sonbul et al., 2022).

Hence, researchers seem to accept that most errors are related to L1 interference. Indeed, scholars have thoroughly investigated the impact of L1 lexical combinations on the acquisition of L2 collocations, leading to extensive exploration in collocational research. This exploration has paved the way for the emergence of congruency in L2 collocations, a topic that will be further discussed in the upcoming sections.

2.9 A Contrastive Perspective on L1 - L2 Congruency

The concept of the L1's role in the learning process traces back to the 1940s with the advent of behaviourism, a paradigm that viewed learning as forming habits. From this perspective, L2 acquisition involves replacing L1 habits with new ones in the L2 context, and the recognition of L1 interference emerged as a significant challenge in the learning journey.

Contrastive analysis, a theory grounded in behaviourism, is a prominent framework acknowledging the impact of L1 on L2. This approach examines similarities and differences between the learner's native language (L1) and the target language (L2), aiming to anticipate and address learners' challenges. The term 'contrastive analysis' was coined by Lado (1957), who asserted that the difficulty in learning an L2 is intricately linked to the degree of dissimilarity between the two languages.

However, as behaviourism began to be rejected and generative linguistics became more prominent, contrastive analysis dramatically declined because not all errors are related to L1 interference or language transfer (e.g., Thao, 2020). On the other hand, other areas of focus emerged. These areas of interest include error analysis, cross-linguistic influence, and the role of L1 in the cognitive approach, which can be considered evidence to confirm the effect of L1 on learning an L2. In other words, different perspectives indicate L1 interference in learning L2 without needing to accept behaviourism (Thao, 2020).

Generally, the cross-language influence concept (a similarity in meaning and form between the L1 and the L2) is used in collocations research instead of contrastive analysis. In this regard, there is evidence that the processing of L2 is facilitated by cross-language influences or the overlap between L1 and L2 (L. Du et al., 2023). Considering collocation learning, the similarity between L1 and L2 is one of the significant determinants of collocation knowledge and has widely been reported in various contexts (e.g., L. Du et al., 2021, 2023; Sonbul et al., 2022).

While language transfer from the L1 of learners can result in positive production and satisfaction when L1 and L2 have exact correspondences in both languages (R. Ellis, 2008), previous research found that L1 influences is one of the primary sources of errors in collocation productions even for advanced L2 learners (e.g., Laufer & Waldman, 2011; Men, 2018; Nesselhauf, 2003, 2005; Zhou, 2016). Due to the cross-linguistic relationship, word-for-word translation can have a high potential for error in most languages. One of the best examples used in the collocational study is *strong tea* in English versus *dark tea* in Japanese and Persian.

Therefore, the collocational meaning is divided into incongruent and congruent collocations. Incongruent collocations do not have an identical translation in L1. In contrast, congruent collocations are word-by-word equivalent in L1 or "share identical lexical elements" (Yamashita & Jiang, 2010, p. 649). These two aspects of collocations have significantly affected increasing studies in the collocational area to answer why learners make errors or avoid using collocations. Researchers have demonstrated that L2 learners make errors as a result of L1 influences or transferring L1 collocational patterns to the L2 in various contexts (e.g., Davoudi & Behshad, 2015; Fan, 2009; Gyllstad, 2005; Martelli, 2006; Nakata, 2006; Phoocharoensil, 2011; Rogers & Florescu, 2016; Şen, 2019; Wang & Shaw, 2008). Table 3 illustrates a sample of the potential collocational errors due to L1 interference from different backgrounds.

To illustrate, Wang and Shaw (2008) shed light on specific instances of errors made by Swedish and Chinese learners, such as "*do changes*" instead of "*make changes*," "*do a great effort*" instead of "*make a great effort*," and "*make damage*" instead of "*do damage*" (Wang & Shaw, 2008, p. 215). These errors were attributed to the negative influence of L1 transfer, emphasising the impact of the learners' native languages on their usage of the target language. Similarly, Phoocharoensil (2011) found that L1 transfer was the primary source of errors by Thai EFL learners in learning collocations. The researcher mentioned that the Thai learners' errors included incorrect word choice, collocate redundancy, preposition addition, and preposition omission.

Table 3

Collocations Errors Based on L1 - L2 Congruency with Different Backgrounds

Example (errors)	Correct Form	Language	Reference source
<i>look for money</i> <i>learn knowledge</i> <i>bring some reasons</i> <i>depend with</i>	earn money gain knowledge state some reasons depend on	Persian	Davoudi and Behshad (2015)
<i>expensive price</i> <i>a qualified hotel</i>	High price quality hotel	Thai	Boonyasaquan (2006)
<i>pipe water</i> <i>several thanks</i>	tap water many thanks	Arabic	Fayez-Hussein (1990)
<i>take out conclusions</i> <i>make a photo</i>	draw conclusions take a photo	Greek German	Gitsaki (1996) Gyllstad (2005)

<i>a dark horse</i>	a black horse	Taiwanese	Huang (2001)
<i>notice attention</i>	pay attention	Hebrew	Laufer and Waldman (2011)
<i>try an attempt</i>	make an attempt		
<i>dense tea</i>	strong tea	Chinese	Men (2018)
<i>take contact</i>	make contact	Japanese	Nakata (2006)
<i>pay sacrifice</i>	make a sacrifice		
<i>make one's homework</i>	do one's homework	German	Nesselhauf (2003)
<i>make your homework</i>	do your homework	Dutch	Peters (2016)
<i>do a suggestion</i>	make a suggestion		
<i>My home stays</i>	My home is	Thai	Phoocharoensil (2011)
<i>domesticate fish at home</i>	Have/keep		
<i>do changes</i>	make changes	Swedish	Wang and Shaw (2008)
<i>do a great effort</i>	make a great effort		
<i>make damage</i>	do damage		
<i>Narrow room</i>	small room	Japanese	Wolter (2006)
<i>have risk</i>	take a risk	Chinese	Zhou (2016)
<i>have harm</i>	cause/do harm		

According to Davoudi and Behshad (2015), Iranian students majoring in English Language and English Translation make 75% of their errors when writing essays because of a lack of collocational knowledge. Based on the study's findings, the language learners' mistakes were caused by L1 transfer (47.3%) and synonym strategies (35.1%). In a recent study, 47% of Turkish learners' verb + noun collocation errors were caused by the L1 influence (Şen, 2019). In this way, word-for-word translation or replacing one word with a synonym could lead to incorrect formulations. This assumption could raise the possibility that learners relying on the L1 patterns may not determine the correct collocation.

Two additional supportive assumptions for L1 interference exist. Firstly, research by Boers (2020) indicates that transparent MWUs with high frequencies are seldom detected. Consequently, learners should be familiar with distinctions between L1 and L2 collocations. Secondly, the study by Macis and Schmitt (2017a) suggests that more transparent meanings are acquired before those less transparent. For instance, there is a tendency among Persian learners to utilise *take a decision* instead of the correct form *make a decision*. This differentiation between *take* and *make* warrants attention and clarification in language education. In another condition, when Persian learners produce the proper combination of *take a photo*, L1 German learners are likely to use the term *make a photo*. These instances highlight the impact of L1 interference and the importance of addressing such subtleties in

language learning. Hence, it is essential for language learners to discern the appropriate usage of word combinations.

Based on the learnability of items, numerous studies support that congruent learning of collocations is easier than non-congruent learning (Granger, 1998; Nesselhauf, 2003; Peters, 2016; Wolter & Gyllstad, 2013; Yamashita & Jiang, 2010) and learners make more errors with incongruent collocations (Davoudi & Behshad, 2015; Wolter & Yamashita, 2015). For instance, Nesselhauf (2003) found that incongruent word combinations were more difficult for advanced L1 German learners than congruent words. Granger (1998, p. 151) indicated that native speakers used *severely punished/ restricted/ shaken/ attacked/ depleted/ complicated/ felt/ flogged* while French learners used *severely punished*. Granger states that *severely punished* equivalent to *sévèreent puni* and other combinations were not equal in French, and the learners use more congruent collocations due to transfer from L1.

Regarding congruency as an essential factor to consider in collocational processing in L2 learning, there has been a growing interest in evaluating the relationship between L1 congruency and other factors (L. Du et al., 2021; Fang & Zhang, 2021; Özdem-Ertürk, 2021; Sonbul & El-Dakhs, 2020; Sonbul et al., 2023). More significantly, Sonbul and El-Dakhs (2020) examined the interaction between congruency and Arabic English learners' proficiency levels. This study found that these two factors influenced a timed and untimed collocation recognition test to the extent that the effect of congruency was reduced when proficiency levels increased. These recent studies could be more supportive evidence for the role of L1 interference in teaching MWUs. However, research (e.g., Sonbul et al., 2023) also found that the role of congruency fades with increasing proficiency.

Moreover, empirical studies reported that congruency is critical for translation trainees and learning other languages. Sonbul et al. (2023) demonstrated that congruency and form recall knowledge influence the ability to render acceptable collocations in an English into Arabic translation task. This finding suggests that translation classes should explicitly emphasise incongruent and opaque items. Moreover, Boone et al. (2022) conducted a longitudinal study with 50 Dutch (L1) undergraduate students majoring in

German. They found that in a mixed-effect model, there was a significant effect between congruency and time, suggesting that teachers and material developers emphasise congruency with particular attention to incongruent items.

Subsequently, it is imperative for L2 learners to engage more frequently with incongruent L2 collocations rather than congruent ones to mitigate errors. It would seem logical to spend more time teaching such items (Chan & Liou, 2005; Fayez-Hussein, 1990; Nesselhauf, 2005) and to pay more attention to non-congruent collocations (Al-Zahrani, 1998; Bahns, 1993; Biskup, 1992; Wolter & Gyllstad, 2011). In contrast, some scholars accepted that the effect of L1 on collocational fluency is minimal (Dechert & Lennon, 1989; Lennon, 1996; Ringbom, 1998), and teaching L1 - L2 congruent collocations could waste time. On the other hand, collocations in EFL are particularly difficult to teach because it is difficult to determine which combinations should be trained, and the first step in answering this question is to investigate the errors learners make when using collocations to identify the difficulties learners face (Martelli, 2006).

Providing a collocation resource and avoiding errors due to L1 influence can be achieved by ensuring L1 - L2 congruency. Despite its importance, this criterion has yet to be addressed in materials development due to its complexity and time-consuming nature of the process. To illustrate, Shin (2006) points out that L1 - L2 congruency is crucial. However, his study compared only 10% of English collocations with Korean. Only one large-scale study is based on this criterion (Rogers, 2017a). After developing a list of 11,200 high-frequency lemmatised concgrams and translating them into Japanese, Rogers found that half of the items were incongruent with the language. As a result of such a high ratio of incongruent collocations, the researcher suggested that L1 - L2 congruency is essential when selecting English MWUs for Japanese learners.

Analysing the distinctions and similarities between L1 and L2 is a return to contrastive analysis. By predicting learners' challenges based on these linguistic comparisons, educators can tailor their approaches to address specific needs and foster more effective language acquisition. It is a valuable tool for understanding the intricacies of

language transfer and guiding language learning strategies. Therefore, teaching collocations based on contrastive analysis could be recommendable. In this regard, E. Liu and Shaw (2001) advocate utilising contrastive analysis to guide course book development and formulate tailored syllabi that cater to the linguistic backgrounds of L2 learners. R. Ellis and Barkhuizen (2005, p. 52) state that contrastive analysis provides two purposes.

First, contrastive analysis clarifies why students make mistakes. Second, it includes information on the structural aspects of the target language teachers should consider. Despite criticism of contrastive analysis, some researchers believe that it is a practical approach for comparing languages, translating, creating bilingual materials, explaining learners' errors, identifying difficulties, and exploring the fundamental aspects of the language learning process (e.g., Laufer & Girsai, 2008; Nesselhauf, 2005; Tajareh, 2015). Therefore, contrastive analysis is desirable (Nesselhauf, 2005) and is considered by some researchers to be essential in teaching (Laufer & Girsai, 2008).

Moreover, Şen (2019) advocates creating a bilingual list of lexical collocations specifically designed for Turkish learners of English. In the same vein, Berti and Pinnaivalia (2012) argue that the advantage of the bilingual dictionary for Italian learners is that it helps them "look up to find a desired collocation" (p. 216). Also, in a case study, Ziafar (2015) draws attention to the challenges Persian learners face, noting the absence of a structured knowledge source for formulaic expressions. Consequently, Ziafar suggests the necessity of a comprehensive contrastive reference book to provide the needed support in deciphering the meanings of these expressions. Collectively, these studies underscore the importance of tailored resources and bilingual tools in facilitating the learning process for students across various linguistic backgrounds.

Hence, this study employs a contrastive analysis approach to craft a collocations resource for Persian learners. The focus is on leveraging L1 - L2 congruency as a fundamental criterion for directly identifying MWUs suitable for instructional purposes. The research delves into the correlation between the productive collocational knowledge of advanced English-learning students, specifically those of Iranian or Persian background.

Through rigorous testing, the aim is to understand the dynamics of L1 - L2 congruency and its impact on the participants' mastery of MWUs. This approach promises valuable insights into the nuances of collocational knowledge acquisition, shedding light on the role of linguistic congruency between the learners' first language and the target language in this process.

2.10 Semantic Transparency⁴

Semantic transparency refers to the literal or opaque meaning of MWUs. In other words, *semantic transparency* is defined as “the meaning of the whole combination can be deduced from the meaning of the individual elements” (Men, 2018, p. 21). One way to classify and define MWUs is based on semantic transparency or by using differentiation between *free word combinations*, *collocations*, and *idioms* (see Table 4). Generally, all the classifying criteria of collocations have come from studies based on the phraseological approach. In this view, collocations consist of at least one word “that must be utilised in a semantically non-transparent” (Wolter & Yamashita, 2015, p. 1194).

Table 4

Definition of Collocations Based on Semantic Transparency

Researcher	Collocational definition
Gyllstad and Wolter (2016, p. 315)	“An item with two transparent constituents would correspond to ‘free combinations’, and an item with one transparent and one opaque constituent would be akin to the phraseological definition of ‘collocation’”.
Howarth (1996, p. 47)	“One component is used in its literal meaning, while the other is used in a specialised sense. The specialised meaning of one element can be figurative, delexical, or technical and is an important determinant of limited collocability at the other. These combinations are, however, fully motivated.”
Men (2018, p. 27)	“Collocations are then defined as combinations of two or more words which are characterised by a restricted range of co-occurrence in at least one of their constituent words and by relative transparency in meaning”.

⁴ This section is adapted from Barghamadi et al. (2023). The use of semantic transparency and L1 - L2 congruency as multi-word units selection criteria.

Laufer and Waldman (2011, p. 648)	“Habitually occurring lexical combinations that are characterised by restricted co-occurrence of elements and relative transparency in meaning”.
--------------------------------------	--

Therefore, this method precisely characterises MWUs as combinations comprising one fixed and opaque word paired with another transparent word. From a phraseological standpoint, *pay the bill* is deemed a free combination, given the literal meanings of both words. Conversely, *pay attention* and *pay a visit* are identified as collocations since the term *pay* assumes a non-literal role in these expressions. Researchers such as Gyllstad and Wolter (2016) noted that collocations could distinguish from idioms by applying semantic transparency criteria but failed to differentiate between free combinations and collocations.

On the other hand, some research classified different types of collocations based on the degree of semantic transparency (e.g., Henriksen, 2013), including literal, semi-transparent, and non-transparent, adding complexity to understanding these linguistic units. For instance, if L2 learners know single words like *take and photo*, the word combination of these two items (*take a photo*) is a transparent collocation. Meanwhile, decoding semi-transparent (*take place*) and non-transparent (*take over*) are challenging based on their constituents. However, understanding and decoding the meaning of non-transparent items are more challenging and salient than semi-transparent items. This evidence can support the acceptance of Nation's (2020) perspective in researching collocations, where the most challenging part is defining what can be considered a collocation and then applying it consistently. The purpose of the current research was not to determine collocations from a new perspective. Instead, the researcher sought to identify the value of the items that should be taught to the learners.

In this regard, some scholars, such as Moon (1994,1997) and Van der Meer (1998), believe that semantic non-transparent words should be considered to teach directly to L2 learners. Despite knowing all the words in a passage as single words, Martinez and Murphy (2011) found that learners needed help comprehending its overall meaning when idiomatic expressions were used. Consequently, some collocation lists are based on non-transparent

items, such as Martinez and Schmitt's (2012) Phrase List, which created 505 items for general English.

Since semantic transparency could be another criterion to identify MWUs, free combination or literal collocations include items utilised in their literal meaning, and figurative consists of words in non-literal definitions have been used in more classifications of collocations (Cowie, 1988, 1994, 2001; Grant & Bauer, 2004; Howarth, 1998). Some researchers claim that it is helpful to classify the collocations into literal, figurative, and core idioms for language learning purposes (Grant & Nation, 2006; Nation, 2020). More specifically, Grant and Bauer (2004) divide MWUs into four categories:

- **Literals/ Compositional:** The meaning of MWUs is transparent or closely related to each item (e.g., *hit the ball*, *break eggs*).
- **Core idioms:** The meaning of whole words is unrelated to the items (e.g., *by and large*).
- **Figurative:** The structures are not literal, such as *hit the nail on the head* and *give someone the green light*, but they could understand the whole meaning. Grant and Bauer note that "figurative language could be reinterpreting pragmatically" to understand the meaning (p. 51).
- **One Non-Compositional Element (ONCE):** When one item of MWUs is non-literal or non-compositional (e.g., *It is a curly issue*).

Recently, Macis and Schmitt (2017b) classified 54 collocations into literal collocations (78%) and figurative collocations (22%). They concluded that when teachers teach collocations, it is essential to consider figurative meanings when they use them. Based on semantic transparency, Yamashita (2018) categorised 240 collocations employed in 5 experimental studies into congruent and incongruent. The results confirm that transparent items dominate the congruent category and opaque items dominate the incongruent category.

On the other hand, a frequently used collocation is likely to have transparent meanings, whereas a collocation with less transparent meanings is infrequent (Webb et al.,

2013). According to Grant (2005), there are only 103 semantically opaque multi-word items in the British National Corpus (BNC), and none appear often enough to be included in a list of the 5,000 most frequent word families. Moreover, in a large corpus study by Rogers (2017a), 86% of MWUs in his list were literal formulations.

Considering semantic transparency as a criterion to identify valuable L2 collocations to teach directly, there are two scenarios. The first scenario, where high-frequency collocations with one non-transparent word are ignored, raises the concern of overlooking commonly used expressions. On the other hand, the second scenario, which involves teaching non-transparent terms directly, could neglect high-frequency collocations with literal formulations. This dichotomy underscores the delicate balance between prioritising frequency and transparency in teaching materials. It is clear that semantically opaque collocations are a higher learning burden. Since literal formulations are still valuable to language learners, this research was to define collocations without eliminating these items.

In the absence of a consensus on the direct teaching of literal and non-literal collocations, this research takes an essential step by investigating semantic transparency. This approach aligns with Rogers's (2017a) work in suggesting whether teaching MWUs should prioritise the literal or only the opaque collocations. Grant and Bauer's (2004) classification is a valuable taxonomy in operationalising this investigation.

2.11 Learning MWUs

In the past few years, it has become increasingly apparent that vocabulary researchers are exploring how items beyond single words are acquired to form lexical knowledge.

“Knowing a word” includes understanding its semantics and what collocated words it frequently occurs with (Nation, 2013, p. 44), thus forming MWUs. There is widespread agreement in applied linguistics that L2 learners stand to benefit significantly from obtaining a sizable number of MWUs. On the other hand, researchers claimed that learning MWUs would be challenging to compare single words since they have a more complex and more protracted structure, are susceptible to different compounding levels, and are often

associated with more ambiguous and figurative meanings (e.g., Pellicer-Sánchez, 2020).

Regarding the learning burden of words, Nation (2020) states that

The learning burden of a word is the amount of effort needed to learn it. Words differ in their learning burden, with some words being very easy to learn because they are like L1 words and others requiring various degrees of effort. The learning burden of a word depends on its relationship with L1 words or words in other languages that the learner knows and, on its regularity, concerning the systems of form, meaning, and use within the L2 (p. 24).

Concerning the complexity of the collocations' nature, collocations may have a more significant learning burden than single words since "it is more difficult to allocate attentional resources to the formal properties of words" (Peters, 2014, p. 90). To make learning collocations easier, finding methods to reduce the learning burden is necessary for some reason. First, it can help determine whether a language learner is likely to be able to acquire particular MWUs relatively quickly and with minimal effort. For another, in cases where pedagogical intervention is considered necessary, it may inform how to implement it. Therefore, the process of learning MWUs and the influential factors that contribute to the process of learning MWUs need to be discussed. It requires an examination of the factors that impact the learning of MWUs and the factors that influence their learning.

2.11.1 Incidental vs. Intentional Learning

There are two dominant approaches in vocabulary learning: Intentional and Incidental. One way to define intentional and incidental learning is based on psychology. In this view, in incidental learning, participants are unaware of the following vocabulary test and deliberate learning, knowing they will be assessed (Webb et al., 2020, p. 716). In this research, incidental and intentional learning are distinguished based on activities. Activities such as sentence production, flashcards, word lists, and fill-in-the-blanks involving vocabulary learning through language-focused tasks are intentional (explicit/deliberate) learning (Lindstromberg, 2020).

Learning vocabulary in meaning-focused tasks such as reading, extensive reading, listening, and viewing are related to incidental vocabulary learning (Webb, 2020b). Research on incidental learning focuses on exploring the frequency of encounters and repetition of unknown MWUs as vital elements, especially in reading a text, compared to viewing or listening (e.g., Pellicer-Sánchez, 2017; Webb et al., 2013). Also, in this area, researchers tend to investigate enhanced and unenhanced target items in reading (e.g., Choi, 2017; Majuddin et al., 2021) and viewing (Teng, 2019). The general findings of these studies suggest that frequency of occurrence and typographic enhancement are efficient ways to gain knowledge of MWUs via incidental activities.

There is a problem since learners usually need to encounter and notice an MWU several times, leading to a slow incidental learning process. Researchers agreed that these words are rare for academic words (Worthington & Nation, 1996) and MUWs (Boers & Lindstromberg, 2009; Rogers et al., 2021). Consequently, they may not have frequently encountered incidental learning activities like reading a text. For instance, in the academic portion of the COCA, Rogers et al. (2021) analysed that the word *direct* as an individual occurred around 18,200 times. In contrast, collocation with *direct* as pivot word occurred only 100 times. Moreover, in a study of 120 pages of one novel, Boers and Lindstromberg (2009) found that most verb-noun collocations occur only once in the text. (e.g., *make conversation*, *tell the truth*) although they expected to see more instances. The researchers concluded that incidental learning of MWUs is even more difficult than single words. More than reading and viewing alone is required (Szudarski, 2012) since collocations are rarely repeated in EFL textbooks or written material to make learning easier (Koya, 2004; Tsai, 2015).

Also, incidental materials need modifications, such as bolding or underling MWUs in the text or captions, called "semi-incidental learning" (Boers & Lindstromberg, 2009, p. 43), to raise learners' attention. Several studies have demonstrated the effect of semi-incidental learning of collocations (e.g., Choi, 2017; Majuddin et al., 2021; Szudarski & Carter, 2016). For example, Majuddin et al. (2021) investigated the role of repetition and typographic enhancement in captioned L2 television. In this study, 122 Malaysian L2 students were

randomly selected for each of six conditions, varying in the presence of subtitles (no subtitles, standard subtitles, enhanced subtitles) and the number of viewings (once or twice). Before watching the video, immediately after watching it, and two weeks later, students were required to complete a cued recall test. The results demonstrated that repetition led to greater comprehension of the content and acquisition of MWEs compared to a single viewing. Both subtitle types positively impacted MWE recall compared to watching the video without subtitles. However, typographic enhancement decreased the benefits of captions. The researchers concluded that learners who watched a video with enhanced captions were at risk of not understanding and watching the video content with standard captions.

Therefore, input enhancement helps learners focus on items that should be included in incidental learning by bringing their attention to them. In light of this evidence, we should emphasise the need for some modification to incidental learning. Furthermore, this evidence illustrates the importance of directing learners' attention when presented with collocations in context to increase L2 learners' knowledge of them and how more than incidental strategies are needed. The noticing hypothesis (Schmidt, 1990, 1992) underpins learners' attention. To learn target vocabulary items, the "noticing and repetition" prerequisites must be met (Webb & Nation, 2017, p. 61). Therefore, out of all the inputs learners encounter, only noticed ones will likely become intake.

Research indicates the effectiveness of deliberate learning in the context of individual words (e.g., Barcroft & Rott, 2010; Joyce, 2018; Pellicer-Sánchez, 2015; Webb et al., 2020). However, limited attention has been given to examining the potential for intentional learning to encompass MWUs (Webb & Kagimoto, 2009, 2011; Zhang, 2017). A recent meta-analysis could be significant supportive research to accept that intentional activities are very effective methods of developing knowledge of the connection between form and meaning (Webb et al., 2020). The meta-analysis by Webb et al. compared four common word-focused activities, including flashcards, word lists, writing, and fill-in-the-blanks on single words. The results demonstrated that flashcards and word lists were more efficient than writing and fill-in-the-blanks. The authors noted the exciting conclusion that although the gain of knowledge

was smaller in writing and fill-in-the-blanks, they were more efficient than reading or viewing in incidental learning.

It is worth mentioning that Webb et al.'s (2020) study investigated single words, and to the author's knowledge, there has yet to be a meta-analysis on MWUs as of March 2023. Also, Pellicer-Sánchez (2020, p. 161) mentions that although some activities, such as links "between idiomatic and literal meanings," refer to MWUs, the same concentrated activities are effective in intentional learning of single words can also be used to acquire MWUs. Therefore, deliberate learning of MWUs can occur through word lists, flashcards, and fill-in-the-blanks.

In another view, some experimental studies have investigated the effectiveness of intentional learning between MWUs and single words (Alali & Schmitt, 2012; Kasahara, 2010, 2011; Peters, 2014). For instance, Kasahara (2011) found that Japanese learners obtained higher scores of MWUs than single words. Alali and Schmitt point out that these activities are more effective in learning MWUs than single words. Intentional learning is based on the noticing hypothesis (Schmidt, 1990, 1992). As well as noticing a new word in both single and MWUs, which is linked to the learning process (Webb & Nation, 2017), exposure to repeating words (Pellicer-Sánchez, 2020, p. 164) and frequency of words (Peters, 2014) can also contribute to vocabulary development. Hence, such explicit activities can help learners become aware of MWUs and promote their use.

In addition, little empirical research has investigated intentional vs. incidental learning on MWUs (Fahim & Vaezi, 2011; Sonbul & Schmitt, 2013; Szudarski, 2012). In this regard, Sonbul and Schmitt (2013) investigated the relationship between implicit and explicit collocational knowledge in both native and non-native by combining three typical learning conditions (enriched, enhanced, and decontextualised) under measuring two explicit (form recall and form recognition) and an innovative implicit (called collocation priming) collocational knowledge. The study resulted in significant long-term gains in explicit recall and recognition for natives and non-natives, but none aided implicit collocational priming effects for natives or non-natives. In contrast, Fahim and Vaezi concluded that implicit

methods are beneficial. As a criticism of intentional learning, it is commonly asserted that these intentional activities, such as decontextualised word lists and flashcards, may not create fluent language use or production (Qian & Lin, 2020). In this regard, some researchers considered concordancers⁵ a possible solution or a complementary for intentional learning (e.g., Pellicer-Sánchez, 2020).

There is no agreement on which activities are efficient for gaining MWUs, and we should not consider them superior or inferior. Classifying intentional and incidental learning is useful when identifying the advantages and disadvantages of different learning styles. However, Webb (2020b) claims that intentional learning is effective and sets the foundation for incidental learning. Schmitt (2008) stated that "intentional vocabulary learning almost always leads to greater and faster gains, with a better chance of retention and of reaching productive levels of mastery than incidental vocabulary learning" (p. 341).

Well-designed materials require language- and meaning-focused activities (Barghamadi et al., 2022). Based upon the discussion above, it can be assumed that when a learner is not exposed to large quantities of information, the time between two experiences with the same MWUs might be too long for the learner to identify it as a repeated MWUs (Boers, 2020). Hence, it could be assumed that when learners incidentally encounter new MWUs, they must be closer to each other to be noticed and reminded. On the other hand, many scholars agree that MWUs are likely stored as chunks (e.g., Nation, 2013; Wray, 2000), and the frequency of occurrence is a fundamental aspect of storing the whole unit. Therefore, noticing new words, repeating them, and frequently encountering them could be effective methods for learning MWUs. Hence, intentional activities such as flashcards and word lists could be crucial in teaching MWUs by providing sample sentences for each item; that kind of resource is the main target of this research.

2.11.2 Factors to Consider in Learning MWUs

⁵ Further information is provided in section 2.15.1.

Language users who use MWUs effectively are often considered proficient by their peers (Bestgen, 2017). This implies that the effective use of MWUs contributes to language proficiency and can enhance communication skills. Therefore, identifying factors that affect learning MWUs is a valuable task. Previous research has explored the number of variables divided into item-related and learner-related as influential on the processing of collocation learning. Regarding item-related variables, several studies emphasise the role of congruency (e.g., Vu & Peters, 2021), transparency (Gyllstad & Wolter, 2016), frequency of collocations and node words (Nguyen & Webb, 2017; Wolter & Yamashita, 2018).

Considering learner-related variables, some critical factors were investigated to influence the processing of collocation learning, such as proficiency level (X. Du et al., 2022), prior knowledge of single words (Nguyen & Webb, 2017), and L2 exposure (Boone et al., 2022). However, the results of these studies were mixed, and it might be impractical to examine all factors in one study. This section focuses on item-related aspects, including congruency, semantic transparency, and item frequency, to achieve the objective of the present research. In addition, this study considers L2 proficiency level as a learner-related variable.

Congruency or “cross-language overlap or influences” (L. Du et al., 2023, p. 2) has been widely reported as one of the salient factors in L2 processing. The role of L1 - L2 congruency was discussed in section 2.9 based on contrastive analysis. It suggested that it is one of the essential factors to consider in creating L2 materials since congruent collocations are easier to learn to compare incongruent items (e.g., L. Du et al., 2021, 2023). More errors would be made if the learners were over-reliant on their L1 to produce collocations (e.g., Laufer & Waldman, 2011). However, many literature reviews have observed the congruency effect and rarely studied attempts to provide L2 materials based on cross-language influences. Therefore, the main objective of the current study is to create a new MWU resource based on this factor. Also, it would be assumed that Persian-speaking

learners achieve a higher score on congruent items. Thus, this factor is examined in the current study.

Semantic transparency is another influential factor in learning MWUs, especially in the phraseological approach and investigating idioms (e.g., Howarth, 1998). There seems to be a tendency to learn more transparent meanings before other types. Macis and Schmitt (2017a, p. 324) noted that "*Take a course*" (semi-transparent collocation) has a slightly more complicated to interpret meaning than "*Take the money*" (literal). However, it is less complex than a non-transparent "*Take sides*" (Macis & Schmitt, 2017a, p. 324), which has the disadvantage of being unable to be understood based on its constituent parts. Also, they found no positive relationship between the knowledge of the figurative meanings and semantic transparency and frequency. However, they discovered a positive relationship between the level of proficiency and collocational knowledge.

In a study by Gyllstad and Wolter (2016), participants judged word combinations based on frequency and transparency, with shorter reaction times for free combinations than restricted collocations. They claimed that the semi-transparent nature of collocations items caused slower processing. Several researchers, like Boone et al. (2022) and Fang and Zhang (2021), ignored reporting the semantic transparency in recent collocational research studies. Although Fang and Zhang (2021) stated that semantic transparency affects the results, L2 collocational processing is significantly influenced by "L1 congruency, semantic transparency, lexical frequency, and L2 proficiency" (Fang & Zhang, 2021, p. 15).

However, researchers claimed that other factors could influence the effect of congruency and semantic transparency. For instance, Yamashita (2018) noted that semantic transparency is not the only aspect of the impact. Other factors, such as cross-linguistic aspects, could also be considered. Furthermore, cross-cultural misunderstandings cause additional interpretation challenges (Boers, 2020) when learners need to become more familiar with contexts due to specific cultural differences. Conversely, it would be impossible to consider all factors in one single study. Besides investigating the role of semantic

transparency in creating collocational material, this item is examined in the productive collocational knowledge test.

The *frequency* effect is widely observed in usage-based models as an influential factor in learning single words and MWUs (e.g., Durrant & Schmitt, 2009; N. Ellis, 2002). More specially, Durrant and Schmitt noted that learners avoided using low-frequency collocations despite frequent usage of high-frequency collocations. Furthermore, within the realm of collocational research, there has been an awareness of the significance of word and collocation frequency within both the L1 and L2 groups. Notably, collocation comprehension tends to lean more on word information for L2 speakers than their L1 counterparts. Nevertheless, as language proficiency improves, there is a shift towards a greater reliance on collocational frequency over word frequency, as Fang and Zhang (2021) and Wolter and Yamashita (2018) noted. These findings supported the “usage-based theory” that noted representation could be affected by the frequency with which specific constructions are used (Bybee, 2006, p. 711).

In addition, in creating a list of MWUs, frequency is typically considered in general and academic lists (e.g., Rogers, 2017a; Simpson-Vlach & N. Ellis, 2010). Therefore, frequency seems to be a critical element to consider when identifying and learning MWUs. However, some researchers believe it is a moderate factor (Durrant, 2014b; González Fernández & Schmitt, 2015). For instance, Durrant's (2014b) meta-analysis of 19 collocation studies found moderate correlations between frequency and collocation knowledge. This item is investigated in current research since collocational research has a mixed frequency finding. While little research investigates learners' knowledge of single-word items and English language skills over different word-frequency levels in the Iranian context (e.g., Derakhshan & Janebi Enayat, 2020), there is a lack of probing collocational knowledge based on word frequency level from Iranian background. Also, a few studies, such as Nguyen and Webb (2017), have tried to investigate collocational knowledge over the different word frequencies. Therefore, the present study examines collocational knowledge over different word-frequency levels.

Proficiency levels similar to single-word acquisition have been reported in L2 collocations. Most studies found a significant positive relationship between collocation knowledge and language proficiency (e.g., Boers & Lindstromberg, 2012; X. Du et al., 2022; Lee, 2015; Men, 2018; Shokouhi & Mirsalari, 2010; Sonbul & El-Dakhs, 2020; Sonbul et al., 2023). For instance, Boers and Lindstromberg concluded that learning MWUs comparable to native speakers is only possible for advanced learners. X. Du et al. (2022) noted that increased L2 proficiency leads to more use of collocations. Collocation use increases more between lower and intermediate levels than between intermediate and advanced groups (Men, 2018).

In contrast, Rogers (2017a) tested 549 Japanese university students' knowledge and found that their knowledge was relatively low. There was no relationship between collocational knowledge and proficiency levels as measured by the Test of English as a Foreign Language (TOEFL). Their findings presented a mixed picture. Consequently, this research aims to address this gap in the literature by evaluating the general collocational knowledge of Persian L2 learners. The goal is to identify whether specific aspects of collocations contribute to heightened learning difficulties for this group. Aspects of collocations investigated include frequency, L1 - L2 congruency, and level of proficiency.

2.12 Teaching MWUs

Even though MWUs constitute a reasonable percentage of spoken and written discourse (Erman & Warren, 2000) and are essential for fluency and L2 learners' proficiency (Shin & Chon, 2019; Wray, 2000), the evidence demonstrates that they are neglected in ELT materials and English courses. In contrast, there are several reasons to confirm that teacher or instructor support is essential to enhancing MWUs' knowledge. The real issue is that there is no agreement and unique definition for MWUs when "you cannot reliably identify something unless you can define it" (Wray, 2008, p. 93). For instance, in the literature review, Wray (2000) classified approximately 50 terms to define MWUs. Therefore, dealing

with this issue is challenging for teachers and researchers when confronted with more than 50 items with overlapping definitions and classifications.

From various theoretical perspectives, one approach defines these items by their semantic transparency, paving the way for exploring phraseological studies. (e.g., Howarth, 1998). From this point of view, classifying a word combination as collocation, at least one of its features, should have a figurative meaning. On the other hand, frequency co-occurrence is utilised in the frequency-based approach. For instance, *read a book* would be identified as a collocation due to the frequency of co-occurrence. In comparison, the combination would be classified as a free combination since the components are literal rather than figurative. Wolter (2020, p. 494) believes that approaching MWUs from a "statistical perspective" with the assistance of corpora is one potential answer to this issue. In doing so, practitioners can create lists of the most common MWUs in the language without worrying about making the sometimes "tricky distinctions between" different forms of MWUs and their related uncertainties (Wolter, 2020, p. 495). The present study defines MWUs and collocations as one entity following this approach. It would be a simple solution to focus on MWUs without attempting to distinguish between those items.

In another view, there are several word combinations to express themselves with the correct grammatical structure, but only a few of them are acceptable. Collocation knowledge extends semantic knowledge in many ways since it may be linked to the semantic properties of each word (Jarvis & Pavlenko, 2008). For example, *strong* and *powerful* words are synonyms; only *strong* is collocated with *coffee*, and *powerful* comes with an *engine*. According to Macis and Schmitt (2017a), most collocation pedagogy and textbooks have focused on word combinations with literal meanings.

Consequently, the evaluation of L2 pedagogy indicated insufficient collocations in L2 textbooks and activities (Boers et al., 2017; Molavi et al., 2014; Tsai, 2015; Vu & Michel, 2021), and finding a universal resource for EFL and ESL learners could be impossible. Compounding these issues revealed that generally, L2 learners rely on their L1 to produce English collocation, leading to unacceptable word combinations among different

backgrounds with high levels of proficiency (e.g., Nesselhauf, 2003; Zhou, 2016). It is, therefore, essential for teachers to support L2 learners in acquiring knowledge of these items.

From a pedagogical point of view, it may not be surprising that several researchers have tried to learn more about the factors that drive the learning of common L2 collocations and provide an effective language instruction process. Preliminary studies of collocations suggested that the direct teaching of these items is required (Doughty & Williams, 1998; R. Ellis, 1994; Gitsaki, 1996; Koya, 2004; Mackin, 1978; Marton, 1977). For instance, N. Ellis (2001) and Gitsaki (1996) advocated direct instruction and instruction in explicit form in their class. In this regard, Lewis (2000) directly stated that learners' attention to collocations, when possible, could be the first solution.

Several studies have examined awareness-raising activities in line with Schmidt's (1990) Noticing Hypothesis and Lewis's (1993) Lexical Approach to teaching MWUs, such as textual enhancement (e.g., Boers & Lindstromberg, 2012; Boers et al., 2017; Peters, 2012). More specifically, Peters (2012) investigated the effect of typographic enhancement and found that when text is typographically enriched (underlined, bold), L2 learners can better recall reading passages. However, Peters's (2012) results further indicated that teaching students to focus on chunks only had little effect on their memory when there was no statistical significance in the delayed post-test. However, these studies indicated that raising learners' awareness alone has a marginal effect; it is generally agreed that instructional support is crucial because students cannot recognise or notice L2 compounds independently.

On the other hand, several scholars have investigated the effect of explicit or direct teaching of collocations (e.g., Lindstromberg et al., 2016). In line with this, the prominent role of explicit instruction of MWUs would be salient if comparative studies were conducted on awareness-raising activities versus explicit ones. A seven-week study was performed on 52 Spanish learners to assess the effectiveness of chunk attention-directing techniques and explicit exercises by Pérez Serrano (2018). The researcher discovered that while both

approaches led to learning gains in actively identifying the given chunks, explicit practices were significantly more effective in enhancing learning gains than attention-directing techniques.

Consistent with Pérez Serrano's (2018) findings, Boone and Eyckmans (2020) investigated the impact of retrieval practice and attention-drawing strategies on the productive recall of German chunks. In this experimental study, 18 students in the attention-directing group had to reread a video transcript with 22 formulaic sequences (FSs) in bold style and translate the selected items into Dutch (L1) via digital flashcards. In comparison, 11 students in the retrieval condition had to complete the gap-filling exercises and translate selected items into German (L2) via digital flashcards. They discovered that retrieval practice and attention-drawing practice both demonstrated learning benefits. However, learning improvements were more significant in the retrieval condition; they found that retrieval practice-based was more likely to be preserved over time than attention-drawing-based.

Beyond studies demonstrating the efficacy of explicit instruction in acquiring MWU knowledge, the impact of this method on MWU acquisition can be enhanced by additional factors. These include contrastive analysis and translation (Laufer & Girsai, 2008), the congruence effect (Boone & Eyckmans, 2023; Peters, 2014), retrieval practice (Boone & Eyckmans, 2020), and dictogloss practice (Snoder & Reynolds, 2019). In reviewing the pedagogical implications of collocations research, there is a strong consensus that congruency is an influential factor, and focusing on L1 - L2 congruency is recommended (e.g., Boone & Eyckmans, 2023; Nesselhauf, 2003). Hence, contrastive analysis would lead to awareness of interlingual differences.

Further, several researchers have endeavoured to create MWU lists based on distinctions between different forms of MWUs to support teachers and learners, such as the *Phrasal Verb Pedagogical list* (Garnier & Schmitt, 2015), *Collocation list for L2 beginners* (Shin & Nation, 2008), and *academic collocation list* (Ackermann & Chen, 2013; Rogers et al., 2021). Discussions about L2 learning and teaching about word lists are often linked to the unfavourable stereotype of deliberate memorisation of context-free words (T.

Dang, 2020). Nonetheless, it is essential to emphasise that efficient use of the appropriate items can help such learning positively contribute to the growth of L2 vocabulary by using flashcards instead of word lists (Barghamadi et al., 2022; Nakata, 2020). Therefore, well-designed word lists and flashcards are vital for successful intentional learning. The main objective of this study is to consider explicit instruction by using contrastive analysis, L1 - L2 congruency and retrieval practice by creating a digital flashcard with example sentences.

Overall, several factors have been identified as influencing pedagogical attempts. The evidence demonstrated that more than raising learners' attention to collocations is required. If language instructors advocate the effect of incidental activities, they need to provide typographically enriched techniques, such as underlined and bold items. In contrast, if they engage in explicit instruction, contrastive analysis and translation, L1 - L2 congruency, and retrieval practice (e.g., flashcards) would be desirable. Also, the integration of these two activities could overcome each limitation.

2.13 Assessing MWUs

Since MWUs have grown significantly, researchers have been motivated to identify and develop lists of these items and design tests to evaluate them. However, there are several standard measurements for single words, such as *General Service List* (West, 1953), *New General Service List* (Browne, 2014), and *Vocabulary Levels Test* (Nation, 1990); testing MWUs is not standardised and no test exists that is recognised as the best way to measure it (Gyllstad & Schmitt, 2018). The main obstacle to developing a test could be rooted in the variation of MWUs' definition and categorisation, leading to a challenging situation when there is no universal definition for them. Therefore, when researchers create MWU tests, the items selected could differ between experiments because of the various theoretical perspectives.

Another potential challenge to creating a standardised test is that there are "several hundreds of thousands" (Pawley & Syder, 1983, p. 213) of these items, and L2 speakers know around 4,200 MWUs (Brysbaert et al., 2016). Hence, researchers are faced with a

considerable number of MWUs. In the first step, the lack of a universal definition and access to a sufficient list of these items are salient. Also, several factors influence learning MWUs, such as congruency, semantic transparency, frequency, proficiency level, L2 immersion, and L2 vocabulary size, which could be another difficulty in designing a high-quality MWU test.

The literature evaluation regarding the MWUs test indicated that few studies had developed collocation knowledge tests as their objective. For example, *Word Associates Test* (Read, 1993), *COLLEX* and *COLLMATCH* (Gyllstad, 2009), *CONTRIX* (Revier, 2009), and *DISCO* (Eyckmans, 2009). All of these tests follow a recognition format to measure receptive knowledge. Gyllstad (2009) specifically designed *COLLEX* with 50 items and *COLLMATCH* with 100 items to measure verb-noun collocations. In *COLLEX*, the task involves selecting the correct format from three items. One represents a frequent collocation target, while the other serves as infrequent distractors (Figure 1). In *COLLMATCH*, the structure follows a Yes and No format. Illustrated in Figure 2, this activity prompts participants to determine whether the presented items frequently co-occur in English.

Figure 1

A Sample of a COLLEX Item (Gyllstad, 2009, p. 157)

	a	b	c			
a. drive a business	b. run a business	c. lead a business	<table border="1" style="border-collapse: collapse; width: 100%; height: 40px;"> <tr> <td style="width: 33%;"></td> <td style="width: 33%;"></td> <td style="width: 33%;"></td> </tr> </table>			

Figure 2

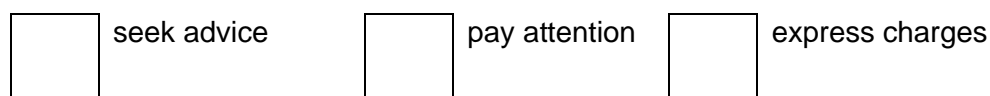
Two Samples of COLLMATCH Items (Gyllstad, 2009, p. 158)

<i>catch a cold</i>	<i>draw a limitation</i>
Yes <table border="1" style="border-collapse: collapse; width: 60px; height: 30px; display: inline-table; vertical-align: middle;"></table>	Yes <table border="1" style="border-collapse: collapse; width: 60px; height: 30px; display: inline-table; vertical-align: middle;"></table>
No <table border="1" style="border-collapse: collapse; width: 60px; height: 30px; display: inline-table; vertical-align: middle;"></table>	No <table border="1" style="border-collapse: collapse; width: 60px; height: 30px; display: inline-table; vertical-align: middle;"></table>

The apparent advantages of these test formats are selecting more items and taking a little time to respond. Taking these test formats comes with the disadvantage that the design does not demonstrate knowledge since L2 learners could guess the answer quickly. Also, the structure of DISCO by Eyckmans (2009) is similar to Gyllstad's (2009) test items. In DISCO, the participants must select two of three options, as illustrated in Figure 3.

Figure 3

A Sample of DISCO Items (Eyckmans, 2009, p. 146)



The format of CONTRIX by Revier (2009) is different and somewhat considers productive and receptive knowledge. Each item includes a gap-filling sentence that needs to select three items to complete the sentence. Gyllstad and Schmitt (2018) evaluated the above tests and noted that their scores regarding overall knowledge of collocations could not be assessed because they need more validation evidence. Therefore, the common drawback of these tests is rooted in the scoring process, and the need for standardised tests for receptive knowledge of collocations persists. Also, they focused on particular items and ignored other affective factors such as L1 - L2 congruency, semantic transparency and selecting items from a frequency list.

Assessing productive knowledge of MWUs still has a long way to go compared to single-word assessment. Corpus-based and gap-filling tests are examples of measuring methods of productive knowledge. Men's (2018) study is one of the corpus-based MWUs studies. Men created a Chinese EFL learners' one-million-word written production corpus. This study found that L2 learners' knowledge of verb + noun collocations lags as proficiency increases. However, knowledge of noun + noun and adjective + noun collocation improves as proficiency increases. Several studies have shown that productive knowledge of MWUs is challenging for L2 learners (e.g., Webb et al., 2013) since non-native essays contain about

half the number of collocations as native ones (Laufer & Waldman, 2011). It seems that the L2 learners avoid using a few collocations or may overuse a few collocations they had mastered. Thus, corpus-based research may not fully expose all aspects of productive knowledge. Moreover, corpus-based studies may not sufficiently control the determinant factors.

Gap-filling tests are advantageous for researchers since they can choose which elements to target, allowing them to manage different factors (Sonbul et al., 2022). Schmitt et al. (2004) designed the *Productive Collocation Test* to measure productive knowledge via the cloze test. Schmitt et al. (2004) provided a more traditional method of assessing productive knowledge of MWUs via a cloze test by following Laufer and Nation's (1999) format for single words. For this type of test, the researchers provided the first letter and the meaning of the target items. However, this format may make managing factors affecting collocational learning challenging when providing meaningful context.

Laufer and Nation's (1999) *Productive Vocabulary-Levels Test* (for single words) was designed based on six frequency bands with 1,000 items. They selected 18 items from each frequency band, providing a contextualised sentence for each item. The researcher noted that the test structure is somewhat similar to a C-test, but it uses sentences rather than paragraphs, and the cues are not constantly half-words. The following illustrates their test format for the word opportunity:

I am glad we had this opp_____ to talk.

Researchers such as Frankenberg-Garcia (2018) and Sonbul et al. (2022) believe that gap-filling tests fail to give learners a real-time representation of the options available during real-time production. Therefore, Frankenberg-Garcia developed an alternative gap-filling test in which participants must fill the gap in a sentence context using all possible collocates for academic purposes. Based on this format, learners could complete the gap with several items. Consequently, Sonbul and her colleagues follow Frankenberg-Garcia's format to measure Arabic learners' general productive collocation knowledge. Below is an

example from Sonbul et al.'s test in which the participant needs to provide as many words as possible:

He was the _____ **manager** in the company.

Possible answers: *top, general, assistant, senior, regional*

With this format, the scoring is not easy, and it is impossible to examine other influential factors, especially congruency. The current study uses Laufer and Nation's (1999) format to assess productive collocational knowledge and investigate influential factors. Since there is just one proper response for each item, and each answer is identified as correct or incorrect, it is simple to mark. However, the present study needed to modify the format of the test. Also, "productive language skills exert a high demand on the quality dimension of learners' lexical knowledge" (Qian & Lin, 2020, p. 72). Therefore, the current study tested productive skills and knowledge. The rationale behind measuring productive language skills instead of receptive knowledge is that productive language knowledge is "more demanding and more likely to result in more" substantial learning than receptive knowledge (Nation, 2020, p. 23).

A significant problem remains in validly assessing learners' knowledge of collocations. The literature reveals that several recent studies have developed different test formats (e.g., Gyllstad, 2009; Revier, 2009), but no attention is given to how to sample collocations reliably. Durrant (2014b) states that learners' broader knowledge of collocations and other influential factors should be examined. This study's literature review demonstrated that L1 - L2 congruency, semantic transparency, and frequency are fundamental to learning collocations. Therefore, this study considers these factors when designing a test.

Although a positive correlation has been found between more items and more accurate estimates, any number over 30 would probably adversely affect practicality due to its length (Gyllstad, 2020; Gyllstad & Schmitt, 2018). While sample sizes tend to be higher in receptive knowledge tests, such as Nguyen and Webb (2017), with 180 items, sampling rates are usually lower in productive tests (See Tables 5 and 6). For instance, Frankenberg-

Garcia's (2018) study included only ten items, while Suhad Sonbul et al.'s (2022) study featured a modest 60 items. This decision was made for practical reasons, considering the time constraints associated with test development, administration, and scoring. Although the studies discussed above provide valuable samples of how collocation knowledge might be assessed, further research is needed.

Table 5

A Review of Test Items on Collocational Productive Knowledge Tests

Researchers	Number of items	Participants
Boone and Eyckmans (2023)	50	45 Dutch learners
Boone et al. (2022)	55	50 Dutch learners
Farghal and Obeidat (1995)	22	56 Jordanian learners
Frankenberg-Garcia (2018)	10	90 students with different L1
Jaén (2007)	40	63 students at the University of Granada
Nizonkiza (2012)	40	100 Belgian students
Rogers (2017a)	50	549 Japanese learners
Sonbul et al. (2022)	60	27 NSs and 55 NNSs (Arabic)
Zareva and Shehata (2015)	32	65 Arab learners

Moreover, Durrant (2014b) conducted a meta-analysis study to determine if there is a correlation between learner knowledge and the effect of collocations' frequency in a corpus of past test results across 19 previously reported tests. Nevertheless, the author has shown a different correlation between different corpora and knowledge for other groups of learners; for selective tests, frequency data should be included in the analysis of sampling collocations. Selecting items from a frequency list was evident in the *PHRASE* Test (Martinez, 2011). It suggests that the percentage of phrases correctly identified, as determined by the proportion of known phrases across all items, serves as a method for assessing language proficiency or familiarity with specific phrases, as described by Gyllstad and Schmitt (2018). Hence, using items from a frequency list would enhance the meaningfulness of the resulting scores, likely because frequent phrases are more relevant and applicable in real-world language usage.

Table 6*A Review of Test Items on Collocational Receptive Knowledge Tests*

Researchers	Number of items	Participants
Eyckmans (2009)	50	25 Dutch learner
Gyllstad (2009)	COLLEX test:50 COLLMATCH: 100	300 Swedish learners
Jaén (2007)	40	63 students at the University of Granada
Keshavarz and Salimi (2007)	50	100 Iranian learners
Nizonkiza (2015)	40	115 Burundian learners
Nguyen and Webb (2017)	180	100 Vietnamese learners

To follow a logical sequence of procedures to investigate performance, (1) defining the construct theoretically, (2) defining the construct operationally, and (3) “establishing procedures for quantifying observations” (Bachman, 1990, p. 40) are fundamental steps to design a test. Gyllstad and Schmitt (2018, p. 182-186) added some extra principles for designing tests of MWUs:

- Tests need to be developed for particular purposes
- Selecting MWUs to test
- Choosing appropriate item formats
- Sampling

Considering Gyllstad and Schmitt's principles (2018), the current study measures MWUs' knowledge of Persian learners. The items from Rogers's study (2017a) were selected and elicited from COCA. Evaluation of literature, frequency, semantic transparency, and L1 - L2 congruency are influential factors in the MWUs process. Therefore, this study endeavours to select items by considering these factors. The limitation is back to sampling. Gyllstad et al. (2015) noted that ten items per 1,000 were enough, and more than 30 items were impractical. There are 11,200 MWUs in this list, which causes a problem for the testing developer because every single item cannot be tested and balancing all factors is challenging. Regarding the practical test with 30 items, this study selected eight items from four frequency levels, leading to 32 items.

2.14 Vocabulary Size and High-Frequency Lists

Further evidence that vocabulary knowledge is crucial to L2 learning comes from studies investigating factors affecting learners' communication. Among L2 learners' language production, lexical errors account for a significant portion of the mistakes and constitute a major barrier to communication (e.g., Llach, 2011). The role of vocabulary would be salient when "achieving certain levels and qualities of lexical knowledge is one of the important prerequisites for successful language learning" (Qian & Lin, 2020, p. 66). As mentioned, vocabulary knowledge is divided into breadth and depth of knowledge. The first refers to how many words are known (size), and the latter refers to how well words are known. In this regard, collocation accuracy was demonstrated as a critical component of depth of vocabulary knowledge (e.g., Crossley et al., 2015).

Considering breadth of vocabulary knowledge, there is a close relationship between the size of a person's vocabulary and their proficiency in the language. The more extensive their vocabulary, the more proficient they are (Miralpeix, 2020). In practice, estimating the number of words in a language could be impossible. Nation (2001, p. 9) believes that this kind of question is very "ambitious" because native speakers of the language do not know the entire vocabulary due to different genres and discourses. Miralpeix (2020) noted that by searching, young L1 learners' knowledge could find "points of contact between L1 and L2 vocabulary acquisition" (p. 194). Several studies have investigated the vocabulary size used by children and adults with L1 and L2 (e.g., Brysbaert et al., 2016; Goulden et al., 1990). The results of one study on children's L1 vocabulary size in English indicated that they learn about 1,000 word families per year (Goulden et al., 1990). Also, Goulden et al. estimated that around 17,000 words were spoken by educated native speakers. A recent study by Brysbaert et al. (2016) found that one American English native speaker recognises 42,000 lemmas and 4,200 multi-word expressions. They suggested that depending on how much a person reads or watches media, the number may vary from 27,000 to 52,000 lemmas.

For pedagogical purposes, several researchers have investigated the percentage of words in a text that a student needs to know and how many words one needs to learn to reach that percentage (Adolphs & Schmitt, 2003; Laufer & Ravenhorst-Kalovski, 2010; Vilkaite-Lozdiene & Schmitt, 2020). For example, Adolphs and Schmitt (2003) found that 2,000- to 3,000-word families are enough for spoken language coverage of 94.76% to 95.91%. When it comes to writing, though, more words are in demand. Vilkaite-Lozdiene and Schmitt (2020) note that 3,000-word families are required to cover 95% of a written text. They said that it is not just any word; the learners must learn the most frequent 3,000 words.

Based on this, knowing how many words students need to learn could be fundamental to developing materials and setting goals for teachers, learners, and program developers. Generally, word families have been utilised in researching vocabulary size (Webb & Nation, 2017). Webb (2020a, p. 5) suggests that the “3,000 most frequent word families” are needed when the aim for students is to understand the most forms of speech. If the students expect to reach “the vocabulary size of an educated L1, they need to learn the most frequent 8,000-word families” (Webb, 2020a, p. 5). Similarly, Webb and Nation (2017) note that to understand most forms of spoken input, learners must be familiar with the most common 3,000-word families. Thus, defining the learning goal could be fundamental to learning vocabulary.

While the word family could be valuable for selecting single words, some researchers claim that the word family approach has technical and pedagogical issues (Vilkaite-Lozdiene & Schmitt, 2020). In a simple view, counting words by word families may not be correct for selecting high-frequency words or collocations because the headwords may not be the most frequent lexical item. As a result, recent proposals suggest that counting units should switch from word families to lemmas (Kremmel, 2016). According to Schmitt (2010), “lemmas are probably the best unit overall, as it is relatively easy to lemmatise words, and they are unambiguous to interpret” (p. 193). In contrast, some researchers have evidence that using lemmas as counting units requires more items to meet the criteria for a high-frequency threshold (Waring & Nation, 1997).

Overall, estimating vocabulary size and the number of words existing in the mental lexicon of native speakers is a complicated process. Consequently, very few studies have assessed how many collocations a native speaker has in their lexicon (e.g., Brysbaert et al., 2016; Hill, 2000). In comparison, the role of frequency in the corpus and exposure frequency for both single words and MWUs has been examined in several studies (e.g., Peters, 2020; Sonbul et al., 2022). For both native speakers and non-native speakers, less appropriate responses were reported at lower frequency levels (Sonbul et al., 2022). Peters (2020) mentions that input of frequent items is more likely to occur first.

To comprehensively teach and learn all collocations is a challenging task. The sheer magnitude of this lexical landscape renders an exhaustive approach unfeasible, prompting a discerning consideration of prioritisation and strategic focus. Therefore, selecting items based on the frequency method has established effectiveness in language pedagogy. The evidence indicated that frequency is a fundamental criterion for selecting vocabulary items, and it is no surprise that frequency has a proven track record of helping language learners (Vilkaitė-Lozdienė & Schmitt, 2020). Also, studies of lexical coverage and Zipf's law indicate that frequent words are essential because they are encountered more frequently (e.g., Piantadosi, 2014).

Conversely, some scholars believe that despite the usefulness of frequency-based lists, the frequency band may only be accurate when integrating other factors. For example, there is little likelihood that any English teacher or writer would teach the phrase *take the bus* (Martinez, 2013) or the single word *pencil* and *orange* (Schmitt et al., 2021) in the latter stages of a language curriculum. Despite their absence from the lexicon of widespread terminology, these linguistic constituents find their place in the lexicon of early acquisition. This anomaly underscores the peculiarities of language learning, where seemingly mundane expressions carve a niche for themselves in the foundational phases of linguistic mastery.

With these assumptions in mind, children acquiring their L1 can learn about 1,000 words yearly, whereas adult L2 learners typically do not achieve this rate (Webb & Nation, 2017). Instead, the most frequent 3,000 words are essential for L2 learners. Hence,

providing a list of 3,000 collocations based on the lemmatised approach could be sufficient for L2 learners. This research aims to compile a list of 4,000 high-frequency collocations, which are expected to include critical sub-lexical items that form the collocational chunks and determine which of the MWUs would be the most beneficial for Persian learners to learn. Thus, frequency is combined with L1 - L2 congruency and semantic transparency to finalise the MWUs list to achieve the goal of this research.

However, more coverage studies have focused on single words, and the analysis of collocations and size measurement is still in its infancy. While understanding individual words is essential, comprehension can still be hindered if the figurative meaning, mainly conveyed through collocations, is not understood (Martinez & Murphy, 2011). Therefore, future research will require exploring the extent of text comprehension and the minimum number of collocations needed to achieve a comprehension threshold. This indicates the importance of advancing our understanding of collocations and their role in language processing.

2.15 MWUs Resources

Knowing MWUs contributes to productive fluency since, for learning "a language, you must not only know its individual words but also how they fit together" (Wray, 2000, p. 143). The evaluation of some research, such as Martinez and Murphy (2011), indicates that even though the learners know all the single words in a text, they can still not comprehend the passage's meaning when it consists of idiomatic formulae. In that light, enhancing MWU knowledge must be integral to the vocabulary learning curriculum (Pellicer-Sánchez, 2020). Also, research has indicated that classroom instruction is crucial in successfully obtaining knowledge of these items (e.g., Szudarski, 2017).

Hence, designers of instructional materials and classroom instructors need to be aware of the vital role of MWU. Despite this, they are rarely addressed in language courses (Wolter, 2020) and are seldom incorporated into teaching materials and activities (e.g., Boers et al., 2017; Elyildirm, 1997; Howarth, 1998; Koprowski, 2005; Molavi et al., 2014;

Tsai, 2015). For instance, Elyildirm (1997), in a comparison study, found few verb-noun and adjective-noun collocations in EFL materials in Turkey. He suggested that material designers should consider high-frequency items in addition to the role of L1 interference in creating materials. Howarth (1998) noted that EFL materials focus only on free combinations and idioms.

Also, Molavi et al. (2014) illustrated that other types of collocations needed to be improved in EFL textbooks in Iran. Molavi et al. (2014) investigated the type and frequency of lexical collocations in three ELT textbook series. They found that the textbooks focused on noun + verb and adjective + noun and ignored other English collocations. Their observation highlights a significant gap in the representation of native speakers' usage within textbooks due to the limited range of collocations. The inherent limitation in the variety of collocations featured in these instructional materials skews the portrayal, resulting in an unrepresentative reflection of authentic native speaker usage.

This inconsistency points to the need for teaching resources to conscientiously include a more diverse and authentic set of compositions that reflect the delicate tapestry of language used by native speakers. In line with Molavi et al. (2014), Tsai (2015) investigated the type and frequency of lexical collocations in three ELT textbook series in Taiwan. The researcher concluded that the limited range of collocations in textbooks meant that there needed to be more repetitions of collocations to enable the learner to consolidate knowledge. Consequently, the chosen books in the above studies emerge as unreliable materials, falling short in their impact on learners' comprehension and utilisation of collocations.

Regarding MWU activities, in a corpus of 10 EFL textbook series, Boers et al. (2017) found that more than half of the 323 exercises lack models of MWUs before or alongside the exercises. Koprowski's (2005) study revealed that the MWUs found in three course books contained frequent and infrequent items. In this research, 822 MWUs appeared in the course books, but only seven appeared in two books and none in all three. The researcher asserts that the process of selecting MWUs for inclusion needs to have a principled methodology by

the course designers. This contention implies a need for more systematic and well-defined criteria guiding the decision-making process regarding implementing MWUs within the course curriculum. The absence of a principled approach raises questions about the reliability and efficacy of the chosen MWUs in contributing to the overall language proficiency goals outlined by the course.

Hence, examining EFL and ELT materials from earlier iterations to contemporary releases reveals a persistent demand for an increased presence of MWUs. Importantly, this need is not exclusive to outdated versions of ELT materials; it persists unabated in more recent resources. The deficiency in MWU representation appears to transcend temporal distinctions. This lacuna in MWU provision might be attributed to researchers' formidable challenge in identifying and incorporating collocations. The complexity of the criteria involved in this process renders it challenging and time-consuming, shedding light on the roots of the scarcity of MWU resources in language teaching materials.

On the other hand, there has been an explosion of teaching and self-study materials focusing on MWU recently (e.g., Davis & Kryszewska, 2012; McCarthy & O'Dell, 2005; O'Dell & McCarthy, 2008). *The Company Words Keep* by Davis and Kryszewska (2012) is based on the Lexical Approach and provides 100 activities to raise awareness of chunks, suggesting utilising online dictionaries, corpora, and concordancers to find more information. From a critical point of view, Synnott (2013) pointed out that some exercises are straightforward, and some require L1 translation, so not all practitioners may agree with this statement. From the point of view of this study, the items are selected from the BNC corpus based on frequency. The BNC is four times smaller than the COCA; hence, the number of word combinations selected would be less than in the current study.

While *English Collocations in Use* is a self-study resource for general English by McCarthy and O'Dell (2005), the book was written based on a theme instead of frequency for different levels, with around 5,000 collocations. It used the *Cambridge International Corpus of Written and Spoken English*, inaccessible to researchers. Their efforts should be appreciated. However, the material has not been tested empirically (Boers et al., 2014).

Consequently, L2 learners require alternative input sources to increase learning collocations. In this light, several researchers have endeavoured to identify criterion selection and create general and academic resources by utilising various corpora such as BNC and COCA.

Most previous studies in this field have focused on creating and using academic collocation lists (e.g., Ackermann & Chen, 2013; Durrant, 2009; Rogers et al., 2021; Simpson-Vlach & R. Ellis, 2010). Older versions, such as Simpson-Vlach and R. Ellis's (2010) list, are limited to only 207 items. More recent investigations, such as Rogers et al. (2021), produced large-scale lists of around 5,000 MWUs and used the lemmatised concgrams approach to identify useful MWUs. Moreover, the issue of studies only providing small-scale resources has also affected general English collocation lists (e.g., Martinez & Schmitt, 2012; Shin, 2006). Martinez and Schmitt claim that non-transparent and non-compositional MWUs are highly valuable for L2 learners to learn intentionally. However, their resource is limited, with only 505 non-transparent phrases to compare the current study with a large-scale list of approximately 5,000 MWUs. Accordingly, there is a salient issue in selecting items alongside frequency. Also, whether these items should be learned via explicit or implicit techniques is still under question.

As discussed in the learning MWUs section, intentional learning is typically criticised because it is not accompanied by fluency in language use or production through decontextualised word lists and flashcards (Qian & Lin, 2020). Therefore, these tools are under question due to decontextualised resources and could provide supportive evidence for why researchers are looking for MWUs learning in more meaningful contexts, such as reading graded stories (e.g., Webb et al., 2013). In contrast, Teng (2018) compared the impact of reading-while-listening conditions with reading only among 60 Chinese L2 learners. The researcher found that more words were gained from the reading-while-listening condition. However, in terms of vocabulary acquisition in the forms and grammar of words, word exposure frequency was significantly associated with incidental vocabulary gains but not with the acquisition of meaning or collocations.

The present research subscribes to specific viewpoints, notably highlighting the significance of explicit activities as a foundational and effective approach for acquiring collocational knowledge (e.g., Sonbul & Schmitt, 2013). Additionally, it aligns with findings suggesting that the proportion of words learned through flashcards enhances that acquired through traditional word lists, as evidenced by the work of Webb et al. (2020). The concept of "flashcards" is used to refer to cards for learning L2 vocabulary in "paired-associate learning", where L2 words are encountered in a decontextualised environment, and learners are supposed to make links between "the L2 word form and its meaning" (Nakata, 2020, p. 304). Although a large amount of research has shown that using flashcards is an effective and common way to learn L2 vocabulary (e.g., Hung, 2015; Sanosi, 2018; Webb et al., 2020), few researchers have investigated learning MWUs via this tool (Assaf et al., 2020; Miyakoshi, 2009). The present study claims that designing word lists and flashcards would be recommended via CALL potential to overcome their limitations.

2.15.1 Corpus and CALL's Potential

With the advancement of technology, more approaches such as Computer Assisted Language Learning (CALL), Electronic Learning (e-learning), and Mobile Assisted Language Learning (MALL) are being used in SLA. It has been suggested that CALL encompass all types of technologies, including computer-based software, web-based products, and smartphone applications (Barghamadi et al., 2022). It is well documented that CALL has many advantages over traditional materials for L2 learning. This includes offering students access to resources anytime and anywhere, the ability to repeat exposure, and self-study (e.g., Hirschel & Fritz, 2013; Nakata, 2008; Sung et al., 2015). CALL also offers features not available with paper-based materials, such as audio, spaced repetition, and performance monitoring.

Parallel to CALL, analysing a corpus or significant texts can provide insight into linguistic trends, frequency, and scope of language use. In addition, language learning materials can be developed based on actual language use in the real world (Rogers et al., 2021) provided with computers. As computers get faster and more powerful and corpora of

various spoken and written languages become more available, the quality of collocation research improves (Nation, 2020). Therefore, CALL and corpora play a constructive role in teaching and learning MWUs since linguists discovered MWUs by examining large corpora with computer technologies to develop language materials.

Language learning software developers emphasise vocabulary as one of the aspects of language learning that make up reliable and marketable software (Nesselhauf & Tshichold, 2002). As a result, CALL dramatically increases the number of resources available for lexical development. Also, S. Liu et al. (2014, p. 682) argue that many EFL learners depend on technology “to learn authentic English”. In response, the development of digital tools such as dictionary apps, corpus-based programs, online vocabulary assessment tools, concordancers, and digital flashcards has dramatically increased.

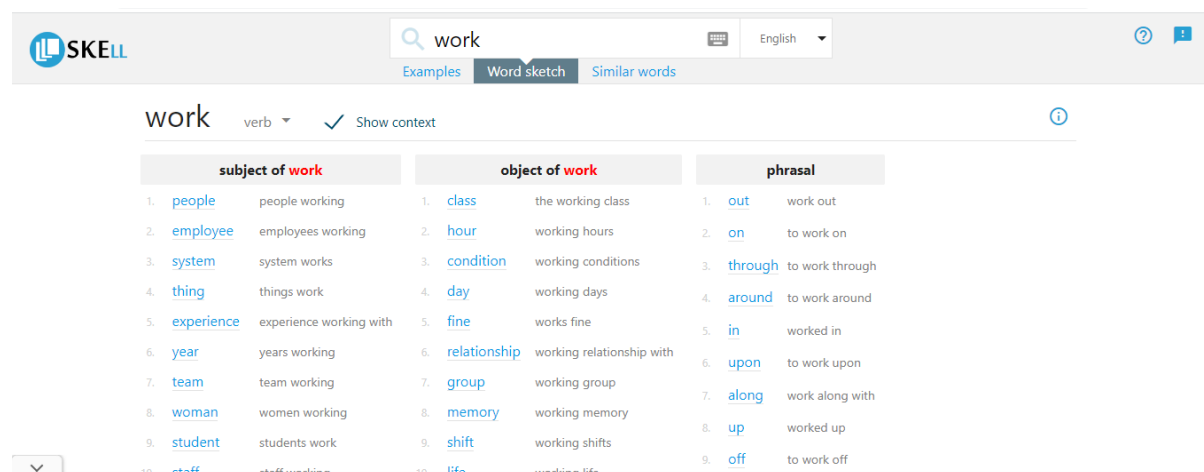
Additionally, students and instructors see CALL technologies as a highly effective language acquisition approach (e.g., Morino et al., 2017; Rogers, 2017b). Consequently, several studies have shown considerable improvements in vocabulary knowledge among Iranian EFL learners via CALL (e.g., Dashtestani, 2016; Mirzaei, 2022). For instance, Mirzaei (2022) conducted a longitudinal study of 240 participants to determine the effectiveness of teaching the keyword method through an application (app) or traditional pen-and-paper. This study compared the encoding and recall training of two pen-and-paper and two app groups as experimental Persian groups and one app and one pen-and-paper as control groups. The results demonstrate that the online application was a favourite method across all groups and a valuable tool for learning new vocabulary, with an average vocabulary recall of 72% for word set 1 and 76% for word set 2.

Based on a literature review and commercial software, Nesselhauf and Tshichold (2002, p. 251) found that “MWUs must be addressed in CALL”. Nesselhauf and Tshichold's (2002) work was cited 68 times in November 2017, according to Cobb (2018). We reviewed 91 Google Scholar citations on this research up to March 2022 and found that teaching MWUs and developing digital resources still need to be addressed in CALL. Few tools focus on MWU and provide incidental and intentional learning facilities.

For example, in line with the Sketch Engine (Kilgarriff et al., 2015), which is a corpus tool for researchers, SkELL (Sketch Engine for Language Learning) is a free tool designed to help students and English teachers discover how proficient English speakers use specific phrases and words. As shown in Figure 4, this tool relies on its users to search for any words and find related information and reports *Examples*, *Word sketch*, and *Similar words*. Therefore, this type of tool is based on raising awareness.

Figure 4

Screen Shot of Sketch Engine for Language Learning (SkELL)

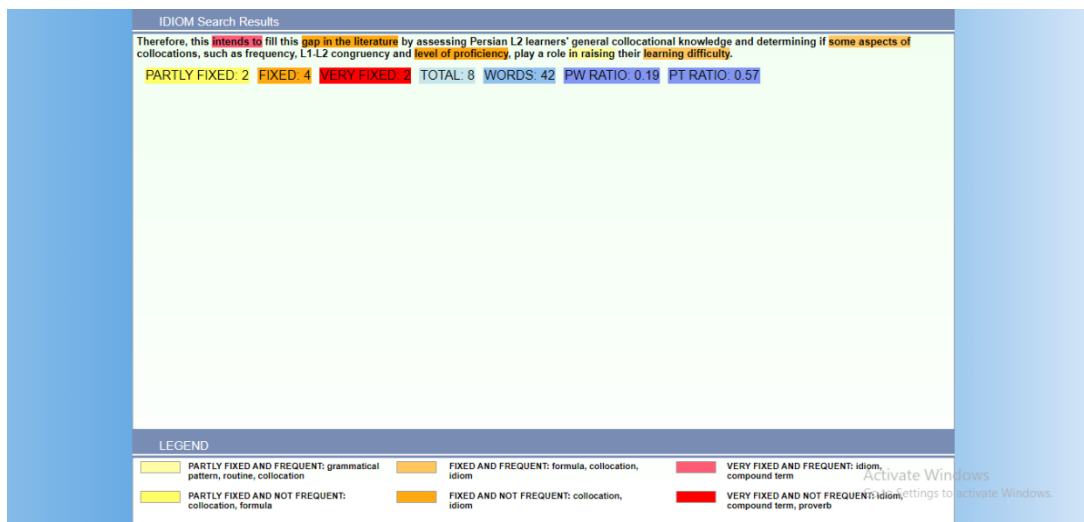


Note: www.sketchengine.co.uk/skell/

In addition, MWU can also be highlighted in a text with *IDIOM Search*. Once the user selects their language, copying and pasting text into the input box, users are presented with a summary of the phrases identified based on the input text (Figure 5). This tool is based on typographic enhancement. Only one empirical study found this tool effective (Kilgarriff et al., 2015). As discussed earlier, typographic enhancements are a promising method of addressing the issue of MWUs slow uptake (e.g., Boers, 2020). However, more research needs to be conducted to evaluate this tool's effectiveness.

Figure 5

Screen Shot of IDIOM Search



Note. <http://idiomsearch.lsti.ucl.ac.be/>

Indeed, certain scholars contend that a concordance serves as a software tool with multifaceted capabilities, facilitating tasks such as locating all instances of a word's co-occurrence within a corpus. This functionality is invaluable in subtly and contextually learning MWUs. Noteworthy, some studies support the proposition that leveraging concordances can be instrumental in enhancing the understanding and acquisition of MWUs within linguistic contexts (e.g., Chan & Liou, 2005; Mohammadi & Mohit, 2021). It is common for every tool to have some advantages and disadvantages. Hence, concordance programs are not exempt. First, using the L1 translation equivalents as the starting point for MWU learning is rarely sufficient to continue the learning process via this tool (Ballance & Cobb, 2020, p. 330). Therefore, the assumption of L1 - L2 congruency as a fundamental criterion to identify collocations that need particular focus to help learners avoid errors due to L1 influence will be ignored. Second, it is also an issue that such software takes much time for teachers to use (Mohammadi & Mohit, 2021), and some beginners could need help learning how to use it.

Therefore, these documents support the idea that CALL developers and enterprises have yet to concentrate on MWUs significantly. The benefits of this idea are still largely hypothetical when CALL vocabulary software is moving to the “small screen (e.g., Duolingo,

Free Rice)” or many flashcard apps focus on single words (Cobb, 2018, p. 199). Following this assumption, noticing new words, repeating them, and frequently encountering them could be effective methods for learning MWUs. There is a tendency to use corpus and CALL's potential to develop digital software to support the assumption and consider L1 - L2 congruency in the current research.

Many researchers have conducted several experimental comparisons between digital flashcards with word lists or paper flashcards to assess how effective each is at gaining vocabulary knowledge (e.g., Dizon & Tang, 2017; J. Li & Tong, 2019; Nikoopour & Kazemi, 2014; Yüksel et al., 2022). For example, J. Li and Tong discovered in their recent study about Chinese language learners embedding visual and audio components into their flashcards that one of the benefits of digital flashcards is that they will retain the information longer. On the other hand, Nikoopour and Kazemi (2014) categorised 109 participants into three groups (Online, Mobile, and Paper Flashcards), and no difference was found between digital and paper flashcards when it came to learning words. However, participants preferred the digital format. A consensus emerges from these works. The collective findings suggest that digital flashcards significantly enhance vocabulary knowledge. This convergence of results across diverse studies lends weight to the assertion that digital flashcards offer a distinct advantage in vocabulary acquisition.

Some studies identified have investigated the effect of self-made or pre-made flashcards (Dodigovic, 2013; Wilkinson, 2020). In the cross-sectional and semi-longitudinal study, Wilkinson used paper word cards in two formats: pre-made and student-made ones. The findings showed that word cards were an effective method of intentional learning. Besides, the results revealed that both self-and pre-made cards were effective, but due to the time-consuming process of making flashcards, 69% of Japanese students preferred to use pre-made cards or "smartphone applications such as Quizlet" (Wilkinson, 2020, p. 243).

Using flashcards during study periods could motivate learners to recall the form and meaning of words and consider the function of CALL. The designers can add more sides

and examples for each item to provide more meaningful context (Barghamadi et al., 2022).

Nakata (2020, p. 313) found that computer-based flashcards possess many advantages:

1. It is possible to apply learning principles more efficiently.
2. Exercises are available with computer-based flashcards.
3. Learners can use computer-based flashcards to track their progress
4. Arrange the review of unfamiliar items at appropriate intervals.
5. Multimedia information can be added.

The significant role of flashcards could be prominent when some recent studies attempt to create digital flashcards for specific purposes. For example, Crandell (2017) developed digital flashcards for the first 500 words of the *Academic Vocabulary List* by Gardner and Davies (2014) in seven different languages. In an experimental study, Yüksel et al. (2022) also created a digital flashcard with 240 technical words to investigate the effect of word lists and digital flashcards. All the above studies considered single words, and few MWU flashcards exist (e.g., Assaf et al., 2020; Miyakoshi, 2009). More significantly, Assaf et al. developed a digital flashcard for 90 lexical collocations identified from reading text in Action Pack 10. One explicit criticism of these studies is that they were limited in context and size. The present study selected 4,600 MWUs in general English based on L1 - L2 congruency to create digital flashcards by following Rogers's words (2017a) to alleviate this shortcoming. Therefore, the current study aims to use the potential of CALL and large corpora to develop a new digital flashcard for Persian learners.

2.15.2 Digital Flashcards Features

The surge in CALL and MALL technologies for SLA material provision has been remarkable in recent years, especially in addressing lexical development challenges. Conversely, digital language learning is gaining prominence as it encompasses diverse technologies (P. Li & Lan, 2021). Digital language learning spans computers, web-based software, and smartphone apps, with CALL often an umbrella term encompassing both computer and smartphone applications. This study refers explicitly to CALL as inclusive of computer and

smartphone apps, considering the widespread availability of similar apps and software on both platforms.

Compared to traditional methods such as books and paper-based flashcards, CALL offers greater functionality and ease of distribution. In lexical development, offering a context for the word is desirable. It can be cumbersome to use pages and print pages. However, this process can be streamlined with technology, increasing the volume, pacing, mode, and context of exposure. Further, the CALL system offers features not available in paper-based materials, including spaced repetition and tracking usage. Thus, digital alternatives have gradually replaced paper word lists and flashcards.

Many flashcard programs have been developed recently, allowing people to use them on smartphones and computers. Converting paper-based materials to digital formats enables users to learn more efficiently and effectively. Therefore, criteria must be defined to evaluate software that represents improvements over traditional paper-based methods. According to the needs analysis, goal setting is fundamental to creating learning materials (Barghamadi, 2020). As a result, it is necessary to define criteria for evaluating software and its functions in creating digital flashcards. This underscores the importance of establishing clear standards for assessing the efficacy and superiority of software tools in linguistic research and applications.

Table 7

Nakata's Flashcard Software Checklist

No.	Criteria	Explanations
1	Flashcard creation	Can learners create their flashcards?
2	lingual support	Can the target words and their translations be created in any language?
3	Multi-word units	Can flashcards be created for multi-word units as well as single words?
4	Types of information	Can various kinds of information be added to flashcards besides the word meanings (e.g., parts of speech, contexts, or audio)?
5	Support for data entry	Does the software support data entry by automatically supplying information about lexical items such as meaning, parts of speech, contexts, or frequency information from an internal database or external resources?

6	Flashcard set	Does the software allow learners to create their own sets of flashcards?
7	Presentation mode	Does the software have a presentation mode where new items are introduced and learners familiarise themselves?
8	Retrieval mode	Does the software have a retrieval mode, which asks learners to recall or choose the L2 word form or its meaning?
9	Receptive recall	Does the software ask learners to produce the meanings of target words?
10	Receptive recognition	Does the software ask learners to choose the meanings of target words?
11	Productive recall	Does the software ask learners to produce the target word forms corresponding to the meanings provided?
12	Productive recognition	Does the software ask learners to choose the target word forms corresponding to the meanings provided?
13	Increasing retrieval effort	Does the software arrange exercises for a given item in order of increasing difficulty?
14	Generative use	Does the software encourage the generative use of words where learners encounter or use previously met words in novel contexts?
15	Block size	Can the number of words studied in one learning session be controlled and altered?
16	Adaptive sequencing	Does the software change the sequencing of items based on learners' previous performance on individual items?
17	Expanded rehearsal	Does the software help implement expanded rehearsal, where the intervals between study trials gradually increase as learning proceeds?

Note. The checklist is based on Nakata (2011, p. 27).

The developers do not seem to be aware of the benefits provided by some features or that providing all criteria for each program is impossible. However, Nakata's checklist could be a fundamental criterion for creating digital flashcards. Some conditions, such as item difficulty, spaced repetition, and multiple-sided flashcards, need to be included. An application requires a schedule that offers repetition and gradually increases the interval between rehearsals until a concept can be remembered (Nakata, 2020). Securing long-term retention is a key objective, and a recommended strategy involves having students review new material shortly after the initial session while progressively extending the intervals

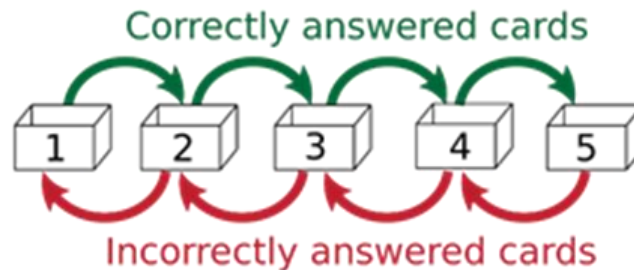
(Schmitt & Schmitt, 1995). This reviewing schedule comes in two forms: massed repetition and spaced repetition or practice.

In massed repetition, the exact contents are studied several times sequentially. In contrast, learners undertake activities regularly over a while with spaced repetition. Much research in single-word learning has demonstrated the benefits of spaced over massed repetition (e.g., Koval, 2019; Nakata & Elgort, 2020). It will increase retention when the same content is repeated more than once at intervals rather than all at once. In this regard, few studies have considered the effect of spaced repetition on MWUs (Farvardin, 2019; Macis et al., 2021). In Macis et al.'s study, 55 Arabic students were divided into incidental learning (Experiment 1) and deliberate/intentional learning (Experiment 2) to learn 25 adjectives + noun collocations. Spacing repetition had a more significant effect on vocabulary learning in intentional than incidental conditions. In contrast, massed repetition has a moderate impact on the incidental condition. The authors concluded that collocation knowledge was best developed under deliberately spaced conditions.

Recognising the superior effectiveness of spaced repetitions over massed repetitions, harnessing the full potential of software capabilities for optimal results becomes crucial. Contemporary language programs like *Anki* and *SuperMemo* leverage spaced-repetition systems to enhance learning outcomes. However, it is essential to go beyond mere repetition quantity since item difficulty also plays a pivotal role (Rogers, 2021). To address this, revisiting Sebastian Leitner's (1972) algorithm-based item, specifically designed to factor in item difficulty, becomes imperative. The structured and adaptive nature of the Leitner system provides a scaffolded learning experience, making even complex or unfamiliar concepts more accessible over time. It is a versatile tool that caters to a wide range of learners and helps bridge gaps in understanding, fostering a more effective and personalised learning journey. Incorporating such considerations ensures a more tailored and practical approach to language learning. Figure 6 illustrates how item difficulty is considered in paper flashcards using Leitner's spaced repetition method.

Figure 6

The Leitner System



Note: The figure shows the Leitner System, an alternate approach where wrong responses are shifted back by one box. Adopted from the Leitner system. (2021, April 5). In *Wikipedia*. (https://en.wikipedia.org/wiki/Leitner_system#References). CC BY-SA 4.0

Three to five actual boxes are used in this procedure. Box 1 will be the starting point for each flashcard. When users get it right, they move a card to the next box. When they make a mistake, they return the card to the preceding box. If an item stays in Box 1 after the first round or transfers to a different box, it will be repeated more frequently. By adjusting the repetition frequency based on the success of retrieval, it optimises the learning process. Items that linger in Box 1 or progress to another box prompt more frequent reviews, allowing for targeted reinforcement of challenging material. It is a strategic approach that tailors the learning experience to the individual's needs, fostering better retention and mastery over time. With the Leitner algorithm-based item sorting, the user can rate an item depending on its difficulty. It gives the additional review needed for more challenging items in a set and enhances learning efficacy. Rogers (2017a) discovered that this method could provide another benefit by adding difficulty item folders. When students must learn 1,000 words divided into 50 items in each set, the challenging items in each group may be transferred to the items' difficulty folders for additional study.

The Leitner-based spaced repetition algorithm has been known since the 1970s (Leitner, 1972). However, previous research found that only 10 out of 161 educational

flashcard smartphone apps used a Leitner algorithm (Rogers, 2014). Leitner's system offers a different and practical approach to learning but may be challenging in a digital design landscape. It could be a case for more awareness among designers regarding its advantages. Cost considerations also play a role (Agu, 2022). However, given its substantial impact on learning outcomes, integrating the Leitner system into digital designs could be a worthwhile investment in the long run. In pursuing refining memory enhancement techniques, some researchers have ingeniously incorporated the Leitner method into the design of flashcards, such as MemReflex and MemoryLifter (Edge et al., 2012; Mubarak & Smith, 2008).

One of the salient reasons to rely on CALL and digital flashcards could be spaced repetition, which is not manageable with paper-based materials, especially with large-scale lists. In fact, this research reviewed the current flashcard apps (Table 8) and indicated that most are equipped with spaced repetition. While this research follows Nakata's (2011) checklist to confirm the essential features of flashcard apps, other factors, as shown in Table 8, could be highlighted by reviewing other apps to select, including:

- **Price:** From the marketing science perspective, consumers typically know little about new items when they assess them. Previous studies on cost-perceived value indicate that under these circumstances, where there is little knowledge and information about the latest product, price is likely to be seen as a hint of quality (Taylor & Bearden, 2002). Regarding different educational services, price is an influential variable, as is learners' intention to select free education options (Agu, 2022). There are many flashcard programs, from free to premium accounts. In this regard, limited applications such as Anki and StudyStack are free. On the other hand, many of them are not free, and with different options to get some additional features, their price increases.

Table 8

Evaluation of Some Flashcards with General Features

Name	Price	Spaced repetition	Sides	Import	Platform	Creation by user	Creation by educators
Anki	Free (except for the iOS app, which is \$24.99)	✓	Multiple	✓	Android, iOS, Linux, Mac, Windows, Web	✓	X
Brainscape	Pro Features \$8/month	✓	2	✓	Android, iOS, Web	✓	✓
Cram	Various	X	3	✓	Android, iOS, Web	✓	X
Flashcards Deluxe	Flashcards Deluxe costs \$6.49 to download	✓	Multiple	✓	Android, iOS	✓	X
IDoRecall	plan for \$132 / year or \$22.00/month. (free version for 200 cards)	✓	?	✓	Web	X	Yes \$38.50/month \$462.00 in a year
Memrise	For a large list \$59.00/year	✓	2	✓	Web	✓	X
NoteDex	\$5.99/month	✓	2	✓	Windows, Mac, iOS, Android	✓	✓
Quizlet	free; Plus: \$47.99/year	✓	2	✓	Web	✓	\$47.99/year
StudyStack	Free	X	2	✓	Web	✓	✓
SuperMemo	Various	✓		✓	Microsoft Windows	X	X
World	Various	✓	2	✓	Android	✓	?

Note: The salient options for this research to consider have been highlighted.

- **Platform:** The platform type might be essential in selecting any program.
- **Creation by user and educator:** Many apps provide easy-to-create cards for users. A limited number of apps may include a feature to make cards by educators. For example, Anki could be one of the best free apps with multiple sides and spaced repetition. However, it does not have a creation by educators and teachers features. Therefore, only learners can create their cards, and if they do not study frequently, their accounts will be deleted after six months.
- **Sides:** One of the advantages of digital flashcards is that they are multisided. Therefore, more than two sides would be desirable.

In addition to flashcard programs, web-based materials are generally free but not equipped with spaced repetition. Typically, this material needs to be created by experts, leading to some costs for creators. However, they are valuable and free to share with learners. On the other hand, some web-based programs have been developed and upgraded with some features (e.g., spaced repetition) that are not free. For instance, IDoRecall is a high-quality web-based program that allows users to upload materials, and the app will create the cards directly.

As discussed in the learning MWUs section (2.11), explicit teaching activities benefit L2 learners through increased exposure and attention. Among these activities, researchers agree that flashcards are one of the most effective tools in L2 learning by motivating learners to retrieve the form and meaning of new words (Barghamadi et al., 2022; Nation & Webb, 2011). Including multimedia elements reinforces the effectiveness of digital flashcards and underscores their significant role in modern learning environments by adding multiple sides, images, and sound (see Barghamadi et al., 2022).

In contrast, some researchers noted that using intentionally designed activities such as word lists and flashcards may not result in language production or usage (Qian & Lin, 2020). Despite this, sample example sentences on digital flashcards might be a viable approach to gaining MWUs through intentional activities. For instance, the first two sides of the flashcards demonstrate MWUs and L1 translations, while the third provides various examples. Sample examples, mainly when applied to flashcards, can benefit learners, particularly in scenarios without direct translation equivalents in their native language. It proves incredibly beneficial for tackling challenges beginners face, like those encountered with concordance software (Mohammadi & Mohit, 2021). Therefore, the current study emphasises that the Leitner System (item difficulty), spaced repetition, and multifaceted flashcards are among the factors to consider when selecting software.

Since one of the objectives of this research was to create a digital format, Flashcards Deluxe (Thomason, n.d.) would be one of the best choices to cover the requirements and all the needed features. The features include five sides, spaced repetitions, easy-to-create, and

a reasonable price. Also, the unique feature is a personalised progress tracker, which monitors users' learning outcomes and success rates over time. Moreover, it provides a permanent account and shareable link.

2.16 Chapter Summary

This chapter has introduced and explored the significant role of MWUs in providing productive fluency. The literature review has illustrated that various approaches are available for defining and analysing MWUs, each with strengths and weaknesses depending on the objective. Also, there is disagreement regarding what should count as MWUs and what should not. This research aims to identify high-frequency collocations and employs a frequency-based approach. Therefore, the frequency of co-occurrence in corpus data is used to search for collocations using high-frequency pivot words and collocates that could be nouns, verbs, adjectives, and adverbs. Whether or not MWUs are phrasal verbs or idioms is not a deciding factor, and collocations or MWUs are treated as a single item in this study. The literature review revealed that word counting and MWU identification were improved by using concgramming to represent occurrences as naturally as possible. Therefore, in the current research, *collocations* are operationally defined as lemmatised concgrams.

Existing research underscores the pivotal role of collocational knowledge in achieving fluency in an L2, both in spoken and written discourse heavily populated by MWUs. Despite these findings, learners from diverse linguistic backgrounds often struggle to exhibit collocational fluency. When learners do not demonstrate collocational fluency, it only makes sense to investigate why this is the case. Various factors contributing to the learning burden have been identified to address this discrepancy. Such factors include insufficient resources, L1 - L2 congruency, semantic transparency, and proficiency levels. Building on these insights, this research delves into the interplay of L1 - L2 congruency, semantic transparency, frequency levels, and proficiency levels of EFL learners. Previous research demonstrated that L1 - L2 congruency is crucial for identifying MWUs and developing a new

resource. Therefore, L1 - L2 congruency, semantic transparency, frequency levels, and proficiency level of EFL learners were investigated in the current research.

Since noticing, repetition, and more frequent encounters with MWUs may improve learning efficacy, deliberate/ intentional activities such as word lists and flashcards are recommended to enhance MWUs' knowledge. According to the literature review, flashcards provide more benefits to comparing word lists, including:

- Keep learners motivated to retrieve the form and meaning of words during the study.
- In comparison to word lists, flashcards lead to more words being learned.

With advances in technology and emerging CALL in L2 learning, digital flashcards could improve the functionality of traditional materials by including audio, visual, and multisensory stimuli, which leads to enhanced learning. However, a limitation lies in the decontextualised nature of these tools. Addressing this limitation, the study leverages technological advances and CALL to develop new digital resources tailored for Iranian EFL learners, enriching the learning experience and emphasising L1 - L2 congruency as a crucial factor in identifying MWUs requiring focused study time. By combining traditional methodologies with cutting-edge technology, this research aspires to contribute to the pedagogical landscape, addressing the subtle challenges of MWU acquisition in the context of EFL learning.

CHAPTER THREE RESEARCH METHODS

3.1 Introduction

The previous chapters described an extensive review of collocation research showing that their knowledge provides fluency and proficiency for EFL and ESL learners. As indicated in the literature review, observations of L2 learners' knowledge of collocations have shown that they lag behind L1 speakers, leading to the exploration of influential factors. Significant evidence has shown that learners' L1 affects their knowledge of L2 collocations. While researchers emphasised that collocation "should be a component of the vocabulary learning curriculum" (Pellicer-Sánchez, 2020, p. 158), evaluating ELT materials revealed that they were limited or neglected.

Additionally, there is no consensus on fundamental criteria for selecting valuable items. Research has shown that the first step towards answering this question is to study L2 learners' collocation errors so that teachers or researchers can identify learners' difficulties in using collocations. In particular, the literature review indicated a clear need to identify valuable MWUs based on their learning burden. Accordingly, the main focus of this study is to provide a new collocational resource for Persian EFL learners by considering item frequency and examining whether L1 - L2 congruency or semantic transparency is a fundamental criterion to select items that need to be taught directly. Thus, the factors determined for learning collocations are investigated.

Therefore, this chapter outlines the research paradigm and methodology by explaining the research design, data collection process, data analysis, and research instruments. Section 3.2 briefly describes the research paradigm and the rationale for the selected methods. Section 3.3 presents the research purpose and the overview of the research questions. In the approach to replication section (3.4), the study maintains consistency with the original research subjects but explores determinant factors and employs more complex statistical analyses. The following section, *Research Instruments and Procedures*, explains the adoption of data collection instruments and procedures. The

primary data collection of the study is described in section 3.6, followed by data analysis. An outline of the conceptual replication study design and the various research steps is presented in the final section of the chapter. This chapter also discusses the ethics and politics associated with this research.

3.2 Research Paradigm

The theoretical framework is typically called the paradigm and affects how insights are investigated and perceived (e.g., Mertens, 2005). The term 'paradigm' is used in educational research to refer to a researcher's 'worldview' (Mackenzie & Knipe, 2006). It is the perspective that a researcher uses to see the world. To identify the research methodologies to be utilised and how the data will be examined, the researcher considers the methodological components of their study using the conceptual lens (see Kivunja & Kuyini, 2017). Creating a research plan requires fitting the theories and practices of the target discipline into a research paradigm (Mertens, 2005). There are two dominant types of research paradigms: The *positivist paradigm* and the *interpretivism paradigm*.

Positivists contend that a single reality can be quantified and comprehended. Consequently, these researchers likely intend to employ quantitative methods in their study. Instead of only one fact, interpretivism thinks there are many realities (Kivunja & Kuyini, 2017). Most qualitative studies undertaken in the social sciences follow this research paradigm. The overall methodology of the proposed study would not be a positivist paradigm since it must use metrics that roughly represent reality. At the same time, it must be acknowledged that it has inherent flaws that cannot be avoided (Mertens, 2005).

According to Kivunja and Kuyini (2017), alterations were made to disconnect some of the presumptions as researchers grappled with the realisation that many of these characteristics are not entirely applicable in contexts where humans participate. Kivunja and Kuyini (2017) argue that the social realm cannot be investigated in the same manner as the natural world, that the "social world is not value-free", and that it is not feasible to propose "explanations of a causal nature" (p. 32). As a result, the post-positivist paradigm was

created, a variation of this paradigm. Therefore, the research paradigm chosen for this study is the post-positivist paradigm. Post-positivism acknowledges the limitations of complete objectivity in research and recognises the inherent subjectivity in interpreting findings. It emphasises the importance of considering multiple perspectives and understanding that researchers' philosophies and biases influence research findings.

The decision to adopt a post-positivist approach is driven by the need to conduct an objective analysis of collocations while recognising the complexity of language learning and the diverse contexts in which it occurs. This paradigm allows for integrating quantitative analysis to identify collocations and assess their difficulty for learners while also considering qualitative aspects such as semantic transparency and contrastive analysis. By embracing a post-positivist perspective, this study aims to provide an understanding of collocational knowledge acquisition and contribute to developing effective teaching materials for L2 learners. The emphasis on methodological rigour and the acknowledgement of the role of researchers' perspectives in shaping research outcomes align with the overarching goals of the study.

It also avoids the problems of classifying collocations into ever-smaller groups and instead seeks to identify the most prevalent, practical collocations. Such research is best served by an objective methodology that uses quantitative analysis to determine the best representation of reality. Therefore, adopting a quantitative research approach not only aligns the research questions with the overall research objective but also provides the thesis with the advantages of legitimacy, trustworthiness, and generalisability (Connolly, 2007). This method's emphasis on standardisation minimises data collection and analysis subjectivity.

Additionally, the ability to replicate studies ensures the quality and reliability of the research method, allowing for consistent outcomes even under diverse circumstances (Cohen et al., 2011; Marsden et al., 2018; Porte & McManus, 2019). Considering a replication study, it would be essential to determine the type of study. There are three types of replication studies: *direct*, *partial*, or *conceptual* (Marsden et al., 2018). In a direct

replication, no variables from the original study are changed. Researchers use partial replications to test the generalisability and limits of a theory by changing one significant element. These changes could be due to a change in instrumentation, participant background, or outcome variable. Additionally, conceptual replications introduce multiple substantial modifications to the original study design. With this in mind, the present study, as a conceptual replication research, aims to follow Rogers's work (2017a) and the procedures adopted in the original research to provide materials for Persian students to learn MWUs. Rogers's list of 11,212 high-frequency MWUs is selected to achieve this goal since it is the most comprehensive MWU database created for L2 learners using the lemmatised concgramming method (LCM), the most modern method for MWU identification.

In line with Rogers's (2017a) study, the first objective of this research is to identify fundamental criteria to select valuable items to create a resource. For this objective, this study uses L1 -L2 rating and semantic transparency classification in the vein of Rogers's approach. However, the research setting to run a test differed from Rogers's work and was altered due to the target participants and variables. Rogers collected data from one Japanese university and considered the TOEFL score data of 549 students. The results of the International English Language Testing System (IELTS) from 283 Iranian student universities were collected to identify the L2 proficiency level in this research. Regarding influential variables on collocational knowledge, Rogers designed a productive test with 50 items based on different levels of congruency and frequency. The present study investigated the effect of semantic transparency and learners' proficiency in addition to L1 - L2 congruency and frequency with 32 items in a productive knowledge test. These alterations led to the conduct of a conceptual replication study.

Moreover, the main focus of this research is rooted in a corpus-based study in which Rogers (2017a) elicited MWUs from COCA (Davies, 2008). Corpora are natural data from spoken and written discourse. Afterwards, they are reliable resources for identifying the words and developing materials for L2 (T. Dang, 2020). As mentioned in Chapter 2, the COCA is the only large corpus and could be the most suitable source for L2 learners (T.

Dang, 2017; T. Dang & Webb, 2016). This corpus balances spoken and written materials and could be "more strongly related to learner knowledge" (Durrant, 2014b, p. 472). Moreover, this study is rooted in the frequency-based approach since Rogers's list selected the high-frequency MWUs.

Various approaches to teaching new skills have emerged to meet learners' needs. All have advantages and disadvantages, and the selection of the methods depends on the learning goal. The Lexical Approach, with particular attention directed to collocations, presents words to the learner in chunks instead of isolated vocabulary. This research follows the Lexical Approach. Furthermore, this research aligns with the post-method, recognising the undeniable presence of an L1 - L2 relation in language acquisition (Stern, 1992). Acknowledging this connection, using L1 is advocated because it can help learners acquire individual and MWUs.

Also, contrastive analysis and semantic transparency are investigated to identify the difficulty of collocations for learners. Contrastive analysis is a crucial criterion for preparing the teaching materials and "making language teaching more efficient" (Altenberg & Granger, 2002, p. 6). An L1 - L2 contrastive analysis may be an efficient criterion to identify collocations requiring special attention to help learners avoid errors caused by the L1 influence by focusing on the similarity and dissimilarity between L1 and L2. Therefore, it is imperative to choose appropriate theoretical frameworks and research methods to achieve research aims in the study design (Appleton & King, 2002). Similar to how several models of language complement one another rather than any one model serving as the only paradigm, this study uses a variety of methodologies to analyse all relevant elements of collocation.

3.3 Research Purpose and Overview of Research Questions

This replication study aimed to create a unique resource of collocations for Persian-speaking learners. Exploring the criteria for selecting valuable items at this level, whether congruency between the two languages or semantic transparency should take precedence. The pedagogical implications of empirical collocation studies, such as the contrastive analysis

suggested by Boone and Eyckmans (2023), underscore the importance of raising awareness regarding the differences and similarities between L2 collocation and learners' L1.

Conversely, the phraseological approach, focusing on semantic transparency as the primary criterion for collocation identification, brings attention to how this factor may impact the processing of collocations (Gyllstad & Wolter, 2016).

The fundamental selection criteria, however, have not been conclusively verified by existing studies. As mentioned above, there are two hypotheses to define the criteria for selecting items, including congruency and semantic transparency. Therefore, to establish a connection within the research design, the following questions regarding MWU identification are set out to address whether L1 - L2 congruency or semantic transparency are fundamental criteria for selecting useful English MWUs to teach explicitly to native Persian speakers:

1. To what extent should L1 - L2 congruency be a selection criterion for developing materials for Persian-speaking learners of English?
2. To what extent should semantic transparency be a selection criterion for developing materials for Persian-speaking learners of English?

Rogers's (2017a) list of 11,212 high-frequency MWUs was selected to achieve this goal. This study utilised his list as the most comprehensive MWU database created for L2 learners using LCM, the most modern method for MWU identification. Also, this list was used because a resource derived from this list was accepted as an official part of the Japanese foreign language curriculum for all first- and second-year students. Thus, this study investigated the percentage of MWUs that are semantically transparent and incongruent with Persian to create an MWUs list. To examine L1 - L2 congruency, his list was translated into Persian and rated based on contrastive analysis. Also, the 11,200 MWUs were classified based on Grant and Bauer's (2004) taxonomy, one of the phraseological approach's taxonomies to confirm the role of semantic transparency in teaching and learning MWUs.

Consequently, the high-frequency MWU items selected in this research were utilised to create a digital resource.

In addition, this study examined the factors that influence the learning of collocations. The literature review identified that congruent collocations and literal or transparent items are more straightforward than non-congruent and opaque ones. This perspective was investigated among Persian-speaking learners to determine whether congruent collocations and literal items are easier than non-congruent and opaque ones. Therefore, this study follows this view as two alternative hypotheses (H_a) for Persian EFL learners:

- H_{a1} : Persian-speaking L2 English learners obtain better scores for congruent collocations compared to incongruent collocations.
- H_{a2} : Persian-speaking L2 English learners obtain low scores for figurative collocations.

Furthermore, researchers have shown that several factors influence L2 collocation development. The main factors are semantic transparency, L1 - L2 congruency, frequency, and learners' L2 proficiency. There has been limited research on the combined effect of these factors, so further research is warranted due to mixed findings (e.g., Fang & Zhang, 2021). The present study aimed to fill these gaps by evaluating productive knowledge of collocations and examining the relationship between Iranian EFL learners' proficiency levels based on IELTS scores, L1 - L2 congruence, semantic transparency, and item frequency via creating an MWUs test from Rogers's (2017a) list. Thus, the following research questions were addressed:

3. Is there a relationship between knowledge of MWUs and Persian-speaking learners' L2 English proficiency?
4. To what extent does Persian-speaking L2 English learners' productive collocation knowledge change over MWU frequency levels?
5. To what extent do the frequency levels, congruency, and transparency of MWUs predict Persian-speaking L2 English learners' proficiency?
 - a) How much variance in participants' IELTS scores is explained by the

frequency of MWUs?

- b) How much variance in participants' IELTS scores is explained by congruent and non-congruent MWUs?
- c) How much variance in participants' IELTS scores is explained by semantic and opaque MWUs?

Concerning RQ5, the final question is broken down into separate items to allow more information to be found about each of the variables when considered as an independent variable.

3.4 Approach to Replication

The literature review indicates that L1 interference consistently emerges as the predominant factor contributing to collocation errors. This approach can be roughly replicated to conduct a contrastive analysis to examine L1 - L2 congruency between different L1s and English using Rogers's (2017a) inventory and steps. These circumstances may make it somewhat challenging to implement transparency classification because there are several classifications in the phraseological approach. Therefore, the study's starting point contained the same subjects as the original research. While the present study follows Rogers's (2017a) probing contrastive analysis and transparency classification for the Japanese language, the proposed research focused on Persian.

In line with Rogers (2017a), the list with L1 - L2 rating and semantic transparency classification based on frequency was utilised to select items for designing a productive knowledge collocation test. The following steps differ from the original study in exploring more determinant factors and complex statistical analysis. His list was rated from 0 to 12 points; Rogers selected five items from this rating. The items in the proposed replication study were divided into congruency with the above six points and somewhat incongruent with 6 points and below. However, Rogers did not select items based on transparency. Semantic transparency was considered when selecting items that would provide more benefits for the current research.

Although a productive knowledge test was designed similarly to the original study, the test format was different. Rogers (2017a) designed a cloze test with 50 items; the first letter of the items was provided except for four target items, with two letters provided. Below are examples from Rogers's test, with the first and two letters provided:

I doubt my son is going to follow t _ _ _ _ _ on his promise to cut the grass.

The shopping centre has a sp _ _ _ _ _ goods store and a shoe store.

On the other hand, the proposed study believed consistency might be considered when selecting items. Therefore, two tests were designed for the pilot study, the first with one letter and the second with two letters provided. Since these types were challenging for participants with English as L1, the C-test format followed Laufer and Nation's (1999) format. In this format, half of each item was provided. Below is an example from the proposed study:

If they eng_ _ _ in activities like that, a player will be kicked off of the team.

Due to additional variables, a more complex statistical analysis was required in the present study. Instead of multiple regression analysis, hierarchical regression analysis and repeated measures ANOVA were used in the proposed research. There was an additional jump-to-run interaction effect between variables. Consequently, a conceptual replication was conducted based on Rogers's (2017a) steps with some alterations and modifications. Since Rogers (2017a) primarily aimed to identify high-frequency MWUs, conducting a similar investigation with Persian-speaking learners confirmed the significant gap in their understanding of collocations. This gap underscored the urgent need to address Persian collocation knowledge among the target population. Thus, these multi-stage replication studies can contribute to validity and improve our understanding of the effects of influential factors.

3.5 Research Instruments and Procedures

3.5.1 The Source of Data in This Study

This study aimed to create an MWU English resource for Persian-speaking English learners. Based on Need Analysis (NA), basic procedures include decision-making, information

gathering, and use (Barghamadi, 2020). The first step was selecting a corpus and then identifying criteria for choosing words to create a list. Using a well-constructed corpus and method to identify useful collocations is imperative in such a study. A corpus is a tool for creating language learning resources investigating “linguists' questions and includes the use of language in the real world” (Rogers et al., 2021, p. 142). T. Dang (2020) and Nation (2016) agree that the nature of corpora impacts the result of the word list and should be selected carefully. BNC and COCA (Davies, 2008) have been utilised in many studies to develop word lists (e.g., Durrant, 2014a; Durrant & Schmitt, 2009; Shin, 2006) and supported by some scholars (T. Dang, 2017; T. Dang & Webb, 2016). From the perspectives of corpus linguistics, both are suitable for L2 learners.

For that reason, this section discusses Rogers's (2017a) steps to develop the list for Japanese students and the significance of this list to utilise in the current research as the primary resource. In Rogers's (2017a) study, the COCA was selected due to the following reasons:

- Development of the BNC ceased in 1993
- The COCA was four times larger than the BNC (450 million tokens and 100- million-token, respectively, at the time of his study)
- The researcher, as an American native speaker, analysed the data

Notably, a 100 million-word ‘real life’ spoken English section has been added to the BNC as part of the British National Corpus 2014 (Love et al., 2017), and the COCA is now 1.1 billion tokens. Even with this improvement, the COCA is still the only large-scale corpus that balances spoken and written materials from spoken, academic texts, newspapers, popular magazines, fiction, TV and movie subtitles, blogs, and web page genres.

The next step after selecting the corpus was to define criteria to scan for MWUs that fit within the parameters. A single word or MWU is most commonly selected based on its “frequency and dispersion” (T. Dang, 2020, p. 295). In searching the MWUs, a frequency cut-off to find the collocations is a fundamental aspect. To select 2,540-word families, Rogers (2017a) decided that a cut-off of one occurrence per million tokens was optimal. He

developed a list of 25,969 lemma pairs and checked manually at this stage. Then, 12,271 duplicate lemma pairs, proper nouns, and language unrelated to learners were deleted, and a list of 12,615 remained. A native teacher scanned this list to find that it covered 90% of valuable collocations. Moreover, the Concgramming methodology (Cheng et al., 2006) changed the lemma to chunks. This software can accommodate constituency variation (i.e., AB, ACB) and positional variation (i.e., AB, BA).

Dispersion refers to how a word or MWU is distributed in different texts. Several researchers state that this criterion is necessary to identify valuable collocations (e.g., T. Dang et al., 2017; Durrant, 2014a; Nation & Webb, 2011). For instance, in the *Academic Spoken Word List* (T. Dang et al., 2017), dispersion was one of the primary criteria for selecting items. Rogers (2017a) utilised five genres from COCA, spoken, academic, magazine, newspaper, and fiction to investigate dispersion data. Dispersion data were evaluated at three different percentages of occurrences in three or more genres (less than 10%, 5%, and 2.5 %) to assess the most beneficial parameter.

Further, the pairs were classified according to these criteria and were investigated by native speakers to see if they were appropriate for explicit instruction in a general English course. The results of dispersion data revealed that the 2.5% or higher cut-off in three or more genres was the most accurate parameter and the largest group with unbalanced dispersion data related to the academic section and fiction. In addition, the dispersion data indicated that the best parameter could define just about half the items that needed to be omitted. Rogers et al. (2015, p. 34) note that the dispersion data analysis identified specialised vocabulary and revealed the limitation of COCA of including a disproportionate food/recipe-related language.

To investigate chronological data analysis, Rogers (2017a) analysed the lemma list to classify pairs that were either dated, too recent, or only existed during a particular time. The outcome showed that only 0.53% of the 12,615 pairs had chronological problems. Rogers (2017a) found this criterion had limited value in identifying collocations. Therefore, this item was ignored in the current study. Otherwise, it would require developing another list

instead of Rogers's MWUs list and examining the chronological data because he investigated data extraction until 2012.

In Rogers's (2017a) comprehensive approach, colligation stands out as a criterion that defines collocational structures based on grammatical class rather than a specific word, a concept explained by Renouf and Sinclair (1991). To operationalise this framework, developing the AntWordPairs software (Anthony, 2013) became pivotal, allowing for the analysis of 500 examples of phrases in each pair and extracting the most frequent MWUs related to those lemmas. The software integrates Someya's (1998) *E-lemma list*, *GoTagger Version 0.7* (Goto, 2005) for part-of-speech (POS) tagging, and *Textcrawler* (Digital Volcano, 2011) for colligational marker replacement, as outlined in Rogers's work (2017a). This meticulous approach not only contributes to the advancement of collocation analysis but also underscores the importance of considering grammatical class in understanding linguistic patterns. Also, this step indicated that a group of words (such as pre-nominal possessive pronouns, numbers, and days of the week) was affected by colligation treatment.

Also, Rogers (2017a) found that this criterion affected 6.4% of the lemma pairs. This process is complex and time-consuming, but it could improve data quality. The researcher claims this criterion could be a problem rather than a solution. The restriction of how to formulate an MWU may not be transmitted to the learner since this item cannot clarify when nouns or verbs are substituted with colligation identifiers. Rogers took the conprogramming method further by creating a novel approach to identify exemplary MWUs from lemmatised conprogram data.

Concordance data from a corpus was collected for high-frequency co-occurring lemma with frequency and mutual information cut-offs to identify exemplary MWUs. For example, *come*, and the *term* frequently co-occurred in Rogers's (2017a) initial data. To identify the exemplary MWU of the data, any data that contained the core unit (*come to terms*) and occurred 50% or more of the core unit's frequency was considered the exemplary unit. The same method was applied if that unit could also be extended further. Consequently, the requirements encompass not just the inclusion of the core unit but also

the inclusion of the core unit, and it succeeds more than 50% of the time (229 instances out of 243 occurrences). Data also indicates that this new exemplar occurs within *to come to terms with* more than 50% of the time (129 times out of 229 occurrences). However, the following extension (*to come to terms with the*) occurs less than 50% of the time as that current exemplar (44 times out of 129 occurrences) and thus, the extending stops there and *to come to terms with* is identified as the exemplary MWU of the lemmatised concgram *come/term*.

Due to the various benefits of Rogers's (2017a) list, this list with 11,212 high-frequency MWU items that consist of example sentences was selected as the main corpus or source of data. The list and the examples were translated into Persian and then rated to find a list of words that consist of high-frequency MWUs based on L1 - L2 congruency (see Section 3.3.2). Then, the list was classified based on Grant and Bauer's (2004) taxonomy to investigate the role of semantic transparency (see Section 3.3.3). Finally, a discrete point test was the source of data collection in this research to assess the collocational knowledge of Persian English learners. The theoretical perspective behind this kind of test was to focus on the isolated target, not other language skills. The test results were stored in Microsoft Excel and SPSS software, which were used for data analysis and statistical tests in this study.

3.5.2 L1 - L2 Congruency Rating⁶

Considerable research shows that learners' L1 can significantly influence their L2 collocational knowledge (e.g., Boone et al., 2022; Sonbul et al., 2023). Therefore, it would be desirable to consider differences and similarities between L1 and L2 collocations, highlighting contrastive analysis. Since the current research focuses on contrastive analysis and investigating the role of L1 - L2 congruency, Rogers's (2017a) list was utilised. In this regard, 11,212 MWUs were translated into Persian and rated based on L1 - L2 contrastive

⁶ This section is adapted from Barghamadi et al. (2023). L1 - L2 Congruency as a Criterion to Identify Collocations Based on Contrastive Analysis.

analysis. As most MWUs consist of 2 to 4 words, 'a 12-point system' was used for the rating process in this research.

In this system, 12/12 points would be for total congruency. For example, when MWUs consist of two words and have the same meaning in both Persian and English, each word will receive six points, which equates to 12 points in total. If one of the words does not match, the score would be six. For example, *make* in *make an impression* (/tæ:si:r bogzæ:rd/ (تاثیر بگذارد)) is not equal in Persian. In this situation, the score is equal to six since it equals to *put an impression*. The articles (a/an/the) that do not exist in Persian were ignored in the rating process. The rating system consists of 0, 3, 4, 6, 8, 9, and 12 points, and all the points were rounded to these points when the number of MWUs is more than four words in the list to create a balanced system (see Appendix A). In brief, the MWUs were rated according to the following protocol:

- Word order is not considered. Like English, Persian is a subject-object-verb or SOV word order. However, depending on emphasis or literary preference, words can appear in any order in a sentence.
- Persian does not have the articles a/an/the. Thus, articles were ignored when rating. For example, the MWU may be '*eat the cake*', but in Persian, it is just said to *eat cake*. Then, such an MWU would be 12/12.
- The word received half its points if it did not match but was in the same word family.
- A loanword or borrowing is a word partially assimilated from one language to another. They received 12 points, such as *Bazaar* (Persian to English) or *Coffee shop* (English to Persian).

Some structures are different between Persian and English. Therefore, they were ignored in the L1 - L2 congruency rating and received total points, including:

- Comparative and superlative adjectives structures: For example, *more/the most dangerous* are two to three words in English to make comparative and superlative

adjectives that are equal to one term in Persian (خطرناک ترین: /xætærnɔ:k tæri:n/;
خطرناک تر: /xætærnɔ:k tær/).

- Negative form: For example, *do/does not work* are two to three words in English to make negative forms that are equal to one term in Persian (کار نمی کند /ko:r næ'mi:kænd/).
- Two words in Persian are equivalent in meaning to one word in English (e.g., Abortion: /sægtʃe dʒenin/سقط جنین).
- Most English verbs are equal to two parts in Persian (For example, *Meet* ملاقات کردن /molɔ:qp:t kærdæn/; *Visit* بازدید کنید /bɔ:zdi:d ku'ni:d/).
- Some word combinations in English, such as *High School/Primary*, are identical to one word in Persian.
- In English, the pronoun is separated, but in Persian, the structure of verbs shows the referee.
- In Persian, one preposition (را /rɔ:/) is used in most structures to complete the meaning that was ignored in rating (e.g., *share information* اطلاعات را به اشتراک بگذارید /etelɔ:ʔɔ:t rɔ: be ʃætærɔ:k begzɔ:ri:d/).

Conversely, numerous English words possess synonymous meanings, rendering the creation of accurate L2 collocations challenging. Therefore, selecting appropriate word combinations becomes crucial, significantly impacting the formation and comprehension of L2 collocations and helping to avoid deviated structures—instances where word combinations do not conform to standard usage or convey unintended meaning. In this study, each word pairing underwent meticulous scrutiny within the context of L1 - L2 ratings to discern their classification as congruent or incongruent in Persian. For example, pairs such as *law/rule*, *enforce/perform*, *air/weather*, *excellent/supreme*, *security/safety*, and *native/local* are synonyms. Consequently, each collocate word pair underwent thorough scrutiny to identify any restrictions in word combinations and categorise them as congruent

or incongruent for Persian learners of English. This examination ensured a comprehensive assessment of collocation congruency, contributing to the accuracy of the study's findings.

Also, some English words with different usages and parts of speech have one meaning in Persian. For instance, *policy/politics*, *sophisticated/complicated*, *social/society*, *science/scientific*, *top/up/high*. Therefore, these items were checked to clarify whether there were differences between these items. For example, *policy/politics* are nouns with the same meaning in Persian. Therefore, based on the L1 - L2 congruency, Persian learners may use these items as deviated (e.g., *global policy*). As a result, they are rated as incongruent items. While these words may have similar meanings, their contextual usage differs, influencing their suitability in forming collocations within an L2 framework. This comprehensive assessment ensures the accurate categorisation of words, facilitates a deeper understanding of the complexities involved in L2 collocation acquisition, and finalises the MWU list.

COCA is an American English corpus. Hence, in the translation process, the online American dictionaries *Longman Dictionary* (LDOCE Online, n.d.) and *Merriam-Webster* (Dictionary, 2002) were used as a reference to double-check the meaning of some MWUs in a context and confirm duplex collocations. For example:

- He could not give an answer off the top of his head (*Meaning from the knowledge you have in your memory*).
- Do not get carried away (*Meaning: Just relax, and let's try to figure out what to do without panicking*).

Duplex collocations, also known as polysemous collocations, have literal and figurative meanings. For example, consider the collocation *to break the ice*. Literally, it refers *to breaking ice to clear a path for boats*, but figuratively, *it means alleviating tension or awkwardness in social situations*. Understanding the literal and figurative meanings of duplex collocations is essential for language learners because it allows them to comprehend the full range of usage of these expressions. When teaching duplex collocations, educators should ensure that students grasp the literal meaning and figurative connotations associated

with them (Macis & Schmitt, 2017a). This comprehensive approach enhances learners' ability to use language effectively and accurately in various contexts. Therefore, in the rating process, half points were considered for duplex collocations in this study (e.g., *inner circle*, *to break the ice*, etc.).

It is worth mentioning that the full results of L1 - L2 ratings were published as supplementary material (see Appendix A). In addition, the literature review indicates that incongruent collocations would necessitate more study time. Hence, items that require extra study time were revealed if a cut-off of six out of 12 is applied to the results of the L1 - L2 congruency rating between Persian and English. MWUs falling below this threshold signify particular linguistic areas where learners may encounter difficulties, warranting further attention in language teaching and learning contexts. These items were used to create a new resource. Inter-rater reliability was conducted on 10% of the list to confirm the reliability of the L1 - L2 congruency ratings.

3.5.3 Semantic Transparency Classification⁷

It is essential to consider that the L1 - L2 congruency rating is separate from the criteria of semantic transparency. The term semantic transparency is defined as “the meaning of the whole combination can be deduced from the meaning of the individual elements” (Men, 2018, p. 21). Some researchers claim that it is helpful to classify the collocations into literal, figurative, and core idioms for language learning purposes (Grant & Nation, 2006; Nation, 2020). Based on Grant and Bauer's (2004) taxonomy, Rogers's (2017a) list was used to investigate the role of semantic transparency and determine whether MWUs were literal, one non-compositional element (ONCE), figurative, or core idioms. In this regard, the following protocol was used:

1. **Literals (12 points):** An MWU is 'literal' if the meaning of each word alone is the same as when paired as a collocation (12 points).

⁷ This section is adapted from Barghanadi et al., (2023). The use of semantic transparency and L1 - L2 congruency as multi-word unit selection criteria.

Example: *eat breakfast, eat the cake.*

2. **One Non-Compositional Element (ONCE) or Semi-Figurative (8 points):** If only one of the core words in the MWU is figurative, then that collocation is considered 'ONCE'.

Example: *driven to quit* (driven: figurative; quit: literal)

3. **Figuratives (4 points):** The entire phrase is figurative, but the meaning can be inferred. Most people think of these as idioms, but they are not. Real idioms cannot be understood and are called core idioms. So, figuratives are what most people think idioms are.

Example: *as good as gold.*

4. **Core idioms (0 points):** If the whole MWU is figurative and it is impossible to reinterpret its meaning to understand it, then it is considered a 'core idiom'.

Example: *Shoot the breeze, a piece of cake, kick the bucket.*

5. **Outliers or Specials (6 points):** These items may contain a homonym that can be easily misunderstood (the significantly rarer homonym is used, such as *bear children*) or situations where the meaning is particular, such as *boot camp* or *bed and breakfast, intensive care, social security, or foster care*. Also, 6 points were given to items where a preposition is used in a way that is very different from its literal meaning, such as *I sort of think* (in this case, 'of' is meaningless to some extent). In addition, if an MWU seems to be formed arbitrarily (there is no rhyme/reason why a particular word is used and not another more logical one), it was also given 6 points. For instance, why *record label* and not *record company*? Why *cast a shadow* and not *put a shadow*?

Table 9 illustrates a sample L1 - L2 congruency rating and semantic transparency classification. However, while analysing the data, the raters began noticing items that did not fit the above categories. Thus, a new type was created and called outliers or specials. When there could be multiple interpretations of a phrase, one often was literal, and the other was figurative. The raters compared the more common usage of the MWU with the Persian

translation. However, when it still needed clarification, the raters looked at the use in the example sentence and rated accordingly. Also, the difference between figuratives and idioms can sometimes be grey. This question was followed to determine if a person who has never heard this before could guess the meaning. If so, it is figurative. For example, in *Kill two birds with one stone*, the learners can guess it from the context (e.g., two problems and solving them with one action). Meanwhile, for others, like *raining cats and dogs*, the learners may be unable to guess easily. Those are idioms.

Table 9

Sample of MWUs with L1 - L2 Congruency with Persian and Semantic Transparency

Classification

MWUs	L1 - L2 Congruency	Semantic Transparency
eye to eye	0	0
made up his mind	3	0
caught my eye	4	4
given name	6	6
took a deep breath	8	8
make it difficult for	9	12
leave me alone	0	12

Also, semantic transparency classification started after the L1 - L2 rating. Some phrases with literal and figurative meanings that Macis and Schmitt (2017a) call duplex collocations were revealed, such as *the bottom line* and *a piece of cake*. Since their literal meanings are clear, in the L1 - L2 rating, the figurative meanings were added to the list. Although 10% of the list was rated for L1 - L2 congruency, inter-rater reliability was conducted on the total list to confirm the reliability of the semantic transparency classifications.

3.5.4 Test Procedure and Scoring

In this field, a significant problem remains in validly assessing learners' knowledge of collocations. Several recent studies have developed different test formats (e.g., Gyllstad, 2009; Revier, 2009), but no attention is given to how to sample collocations reliably to select

items. To infer beyond the sample, the researcher should test learners' knowledge of the particular items and broader knowledge of collocations (Durrant, 2014b) and influential factors. The literature review demonstrated that L1 - L2 congruency, semantic transparency, and frequency are fundamental to learning collocations. Therefore, this study was considered these factors when designing a test.

There was a positive correlation between more items and more accurate estimates. However, any number over 30 would probably adversely affect practicality due to its length (Gyllstad, 2020; Gyllstad & Schmitt, 2018). Therefore, it is essential to select equal items by considering all factors and being practical. Rogers's (2017a) list with 11,212 MWUs was sorted based on frequency. The first step divided the list into four separate frequency ranges (F1, F2, F3, F4). This means 2,803 MWUs are in each group (see Appendix D). Based on the L1 - L2 congruency rating and semantic transparency classification, the results demonstrated that more items are literals. Consequently, more literal items should be selected (see Table 10). As a result, semantic transparency was divided into two subcategories: *Literal* and *opaque* (Figurative, Once, Core idiom, Special). Also, L1 - L2 congruency was broken into 0-4, 6-8, and 9-12.

Table 10

Number of Items Based on L1 - L2 Rating and Semantic Transparency

L1 - L2 Rating	Literals	Opaque			
		ONCEs	Specials	Figuratives	Core Idioms
0-4	1100	253	176	115	145
6-8	3888	302	253	61	33
9-12	4646	122	95	21	2

Next, items with the lowest frequency consisting of L1 - L2 rating and semantic transparency were chosen from each frequency band. Therefore, one item with the lowest frequency was categorised as a literal, and one was selected as an opaque that received an L1 - L2 rating of 0-4. Since the total number of literal items in the 6 to 12 congruency rating

set was three to four times more than in the 0-4 rating set, two literal items were chosen from these sets (see Table 11). Therefore, eight items from each frequency band, as shown in Table 11, were selected, leading to 32 items.

Table 11

Number of Items per Frequency Bands

Semantic	0-4	6-8	9-12
Literal	1	2	2
Opaque	1	1	1
Total	2	3	3

Additionally, in L1 - L2 rating and differentiation between congruent and incongruent items, the classification follows in the current study:

- 0-3 Very incongruent
- 4-6 Somewhat incongruent
- 8 Mostly congruent
- 9-12 Nearly or totally congruent

Thus, this study selected an equal number of incongruent and congruent settings: 16 items with a rating of 6 points and under and 16 items with a rating of 8 to 12 points to control for congruency. These 32 items were also selected based on transparency classification. Since a higher ratio of the MWUs items was classified as literals than opaque formulations, 20 literals and 12 opaque MWUs were set.

Based on this study's definition, MWUs are derived from a pivot word and its collocate. For test questions, the target answer was either the pivot or the collocate, whichever had the higher frequency. The rationale behind selecting the more frequent word was that the participants would be more likely to determine the answer. Cobb's (2013) Vocabprofiler was used with integrated COCA/BNC data to confirm the frequency of the pivots and collocates in each sentence. For instance, the MWU *purchase price* was identified as the most frequent MWU representation of the lemmatised concgram

purchase/price. Therefore, *purchase* was selected as the production target answer since it occurs less frequently than *price*.

- *The p_____ price of our new home was reached after a series of offers and counteroffers.*

As discussed, Rogers (2017a) designed a cloze test with the first letter of the items provided except for four target items, with two letters provided. Alternatively, the proposed study believed consistency should be considered when selecting items. For the pilot study, two tests were designed, the first providing one letter and the second providing two letters. Tests with one and two-letter prompts were trialled with five native English speakers. The findings revealed that tests utilising one and two-letter prompts posed significant challenges, with word length emerging as a detrimental factor impacting the test takers' response capabilities. In instances where none of the participants could provide answers, this trend became particularly evident, such as *best-selling* and *religious*, in the examples below:

- *You've never heard of it? It's a be_____ book!*
- *Governments from various countries worry that re_____ leaders might become too powerful to control.*

Also, five to seven questions remained without answers. Therefore, it was fundamental to consider other factors to control for possible alternative responses, such as:

- The length of words
- Sharing the same letter(s) prompt (e.g., *root*, *road*).

This test adopted the format outlined by Laufer and Nation (1999) to address these issues. Although bearing a resemblance to the C-test structure, this test diverges by adopting a sentence format instead of paragraphs, and cues are not consistently comprised of half-words in Laufer and Nation's (1999) format. However, the C-test format was employed to maintain consistency in this research. This format involved the deletion of half of each item, accompanied by a second hint indicating the number of letters through dashes.

Items with more than three letters were selected for this format. The following presents an example of a test item for the MWU ‘*housing project*.’

- *The housing pro _ _ _ _ was initiated to help provide affordable housing to low-income families.*

To mitigate the possibility of alternative responses, any target item sharing the same onset and number of letters with over 20 other words was replaced with a different item. For instance, based on the criteria for test item selection, ‘*take root*’ should have been included, but 38 words served as alternative responses, including ‘*road*,’ ‘*role*,’ ‘*rose*,’ ‘*room*,’ and so forth. Consequently, these items were excluded and substituted with alternative MWUs. In this particular format, the consideration of target word length was disregarded, as only half of each word was provided. In contrast, specific scholarly inquiries, exemplified by the work of Durrant and Schmitt (2009), have devised tests centred on adjective-noun pairs, employing two-letter prompts sourced from the BNC with a lemmatised frequency ranging from 50 to 100 occurrences per million words. Additionally, these studies specified that the length of the noun should fall within the range of four to five letters (refer to A6 for details).

The purpose of this test was to assess knowledge of collocations rather than knowledge of word forms. Minor spelling and grammar errors, such as *device* instead of *devices*, were disregarded to provide reliability for the scoring procedure. Conversely, if part of speech was ignored, the item was scored as incorrect, such as *violated* instead of *violation*. Additionally, any wrong answers or answers left blank were coded as false. The Ph.D. candidate and a Master’s degree student with three years of English teaching experience and native-level English ability graded each response. Inter-rater reliability was then confirmed. Due to the restrictions imposed by COVID, the test was run online. To control the online questioning, all participants had access to the link once for 30 minutes to answer via Google Docs forms (see Appendix E). The participants could request the researcher to try again for any possible technical issues directly.

3.5.5 Pilot Study

A pilot study can be used as a “small-scale version” or an initial phase in preparation for a large-scale study (Polit et al., 2001, p. 467). Pilot research is crucial before the actual study since it might highlight unanticipated and significant problems with the tools, process, and data collection methods. Additionally, it offers a priceless chance to fix any possible issues. In the present study, two pilot studies were run. Two tests were designed with two forms to finalise the format of the MWU test. The first letters and two letters of each item were provided. Five L1 English speakers evaluated these formats, ultimately selecting the C-test format. Subsequently, this chosen format underwent testing with an additional three L1 English speakers to reach the final format. A second pilot study involving 20 participants utilising the final version of the MWU test was also conducted.

After conducting the pilot studies, a notable observation emerged regarding the extended length of the consent form, which was aligned with the university's prescribed format. Consequently, the structure of the consent form was succinctly summarised to better suit the online format of the test (see Appendix F). Notably, demographic information was omitted, considering its lack of coverage of any study variables. Furthermore, the study confirmed the importance of accessing the test link only once to mitigate potential issues arising from frequent use by a single individual. It is crucial to emphasise that the results derived from the pilot studies were not integrated into the subsequent data analysis.

3.6 Data Collection

This research unfolds with dual objectives, each strategically aligned to contribute significantly to enhancing language learning for Persian-speaking learners. The foremost aim was to create a robust digital resource tailored to this learner demographic. This involved meticulously selecting items strategically chosen to populate a comprehensive web-based and digital flashcard (the selected items were uploaded to Flashcards Deluxe). These innovative resources aimed to facilitate effective learning and serve as a dynamic and engaging tool for Persian-speaking learners seeking to enhance their collocational proficiency.

The second objective was to assess Persian participants through a productive collocational knowledge test. This evaluative measure was designed to gauge the learners' comprehension and application of the selected collocations, providing valuable insights into their collocational competence. This research used a rigorous assessment to reveal the subtle differences in Persian learners' skills using MWU in a targeted language context. The subsequent section systematically delineates the data collection process to achieve these objectives, explaining the strategic steps to create a tailored digital resource for Persian-speaking learners.

3.6.1 Creating a MWU Resource

As a result of the higher learning burden associated with incongruent collocations, the literature review suggests that students need to spend more time studying them. Learning burden items can be arranged following L1 - L2 congruency, with more challenging items requiring more study or instruction. Hence, items requiring extra study time were revealed if a cut-off of 6 out of 12 is applied to the results of the L1 - L2 congruency rating between Persian and English (see Appendix B). A cut-off of 6 out of 12 points was selected since fewer learning elements would help learners attain fluency more quickly. Such a list would benefit students with limited study time who want to focus exclusively on material likely to result in mistakes. These items were used to create digital materials formats.

This research endeavoured to leverage the potential of CALL to continue the study's hypothesis, focusing on acknowledging the L1 - L2 congruency. By harnessing digital software, the study emphasised that actively engaging learners in noticing new words, repetitively practising them, and consistently encountering these lexical units can significantly enhance the acquisition of MWUs (see Barghamadi et al., 2022). The integration of CALL aligns with contemporary pedagogical advancements and underscores the practicality and efficacy of incorporating technology to optimise language learning experiences. There has been a consensus among various studies that using digital flashcards can significantly improve vocabulary knowledge. However, these apps are generally expensive. Also, the target participants have difficulties with international

transactions due to international sanctions (University of Pittsburg, n.d.). Accordingly, one web-based material and one flashcard app were created for this study to overcome these issues.

Since the web-based platform General English Phrases is freely accessible, all Persian learners can study and utilise it. This web-based is similar to a modified digital word list comprising MWU with Persian translation, pivot word, collocates, frequency, and a sample example (Table 12). In addition, the Flashcards Deluxe app (Thomason, n.d.) was selected to create digital cards⁸. The features include spaced repetition mode, five-sided cards, three response levels (I know really well, I kind of know, and wrong), slideshow mode, and divided cards into classifications. There are two ways to create the cards: via spreadsheet and within the app.

Table 12

Sample of Initial Plan to Create Web-Based Resource

Rank	48
Frequency	18700
collocate	Up
Pivot word	Show
MWU	Show up
Translation	حاضر شدن/ رسیدن
Example Sentence	We were supposed to meet at two, but he didn't show up. I have no idea what happened to him.
Persian Translation	ما قرار بود در ساعت دو ملاقات کنیم اما او نرسید. من نمی دانم چه اتفاقی برای او افتاده

Figure 7

Sample of Initial Plan to Create Flashcards

⁸ The flashcards were not used to test the participants. The participants were tested to confirm that L1 - L2 congruency is challenging. After confirming this, a list based on congruency was created and uploaded to Flashcards Deluxe as a learning resource for the participants.

Side 1	Side 2	Side 3	Side 4	Side 5
MWU items	Persian Translation	Example sentence	Persian Translation	Question
take on	به عهده گرفتن	The employee will take on more responsibility if she becomes the new supervisor.	اگر سرپرست جدید شود ، کارمند مسئولیت بیشتری را به عهده خواهد گرفت	The employee will t- --- on more responsibility if she becomes the new supervisor.

Since this is a large-scale study with approximately 4,600 items, the spreadsheet would be an easy way to manage the data. In this format, each row is one card, and the number of columns indicates different sides (Figure 7). Therefore, five sides were needed to show MWU, Persian translation, example sentences, translation, and gap-filling test. After creating the sheet or flashcard text, it was transferred to the website. Since the app automatically facilitated the creation of multiple-choice items, it provided more activities for the target learners.

3.6.2 Participants

In this study, participants were selected based on specific criteria to ensure the relevance and validity of the research findings. Among the demographic information collected, participants' English language proficiency was assessed using the General International English Language Testing System (IELTS). The General IELTS test provides a comprehensive evaluation of English language skills, culminating in an overall score that reflects the individual's proficiency across listening, reading, writing, and speaking (Gagen & Faez, 2023).

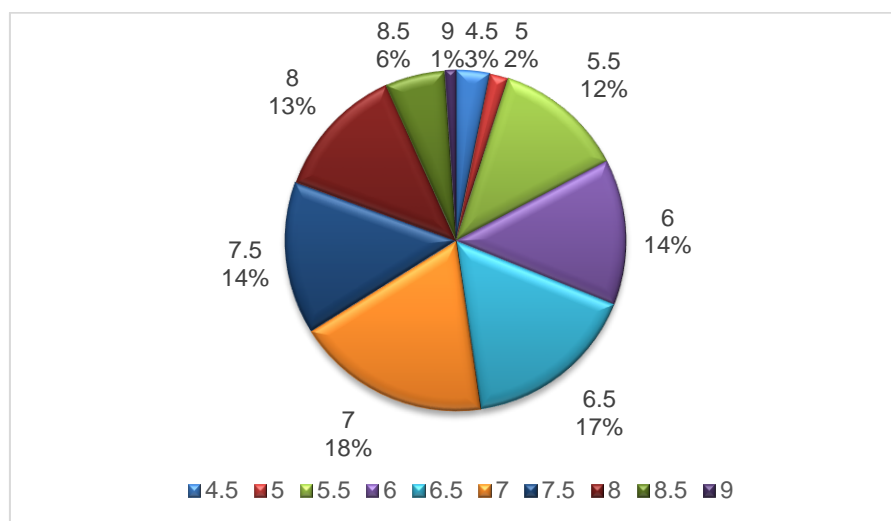
The inclusion of the General IELTS overall score provides a concise measure of participants' English language proficiency levels. This assessment captures participants' overarching proficiency in English language comprehension and communication skills by focusing on the overall score. This information is crucial for understanding the participants'

abilities to engage with study materials, comprehend instructions, and express themselves effectively throughout the research process. Given the diverse linguistic backgrounds of the participants, the General IELTS overall score serves as a valuable metric for assessing variations in English language proficiency within the sample. This standardised evaluation ensures consistency in determining participants' language skills, facilitating the interpretation of research findings within the context of language proficiency.

Two hundred eighty-three ($N = 283$) L1 Persian speakers attended this research. They were undergraduate and graduate students majoring in English Language Teaching and Translation at Iranian universities during the academic year 2021-2022. While the exact ages of the participants were not collected, they typically fall within the range of traditional undergraduate (18-22 years) and graduate (22-30 years) age groups. This age range is expected for students pursuing these degrees in Iran, but it is acknowledged as a limitation that specific ages were not recorded. Figure 8 shows the distribution of the total participants' IELTS scores.

Figure 8

Distribution of Persian-Speaking Participants' IELTS Scores



The sampling method used for this study was voluntary participation. In response to the challenges posed by the COVID-19 pandemic, a comprehensive flyer was developed to direct and invite students. The informational material provided in-depth details regarding the

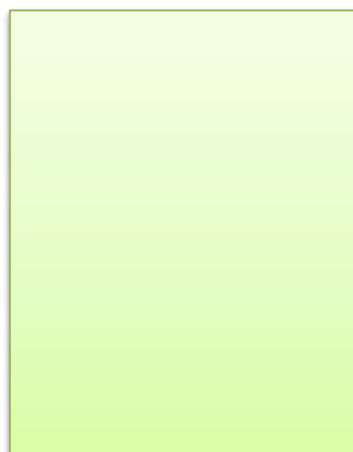
study, its objectives, and the procedures for participation. Participants were informed that their participation in the study would be voluntary and confidential, the data were anonymised and only utilised for research purposes, they could withdraw at any time without facing any consequences, and their consent was obtained during the data collection process (see Appendix F).

During the data collection and analysis process, 27 participants as outliers' data were excluded due to data collection and analysis issues. In this regard, 15 participants with blank sheets, seven with missing IELTS scores, and five without correct answers were removed from the data analysis. The final sample size with $N = 256$ was homogenous because their L1 was Persian (Farsi) but heterogeneous because of different proficiency levels, ages, and genders.

This research follows the Common European Framework of Reference (CEFR) (Council of Europe, 2001) to control the relationship between proficiency level and IELTS score. Figures 8 and 9 show how IELTS band scores correspond with the CEFR levels. In general, 83% of the participants' IELTS scores were above six, meaning that most of the target group was above B2 level based on CERF.

Figure 9

The Comparison Between IELTS Bands and the CEFR Level



Note: This figure was removed due to copyright restrictions. It is available to view online: <https://ielts.org/organisations/ielts-for-organisations/compare-ielts/ielts-and-the-cefr>

3.7 Data Analysis

Researchers agree that L1 - L2 congruency influenced the MWU learning burden and demonstrated that L2 learners make errors due to L1 influences or transferring L1 collocational patterns to the L2 (e.g., Rogers & Florescu, 2016; Şen, 2019). Therefore, a contrastive analysis was conducted to explore the percentage of high-frequency MWUs based on L1 - L2 congruency to identify items with low L1 - L2 congruency by giving L1 - L2 ratings to 11,212 English MWUs. To ensure reliability, a second rater rated 10% of target items. Multiple ratings would have been ideal. However, finding other qualified volunteers for such a task was difficult. As a result, further research is needed to verify the results of this study further.

Researchers such as Macis and Schmitt (2017a) suggested that L2 learners should learn MWUs that are semantically opaque since they have a higher learning burden than literal combinations of words. Consequently, a semantic transparency assessment was conducted based on Grant and Bauer's (2004) taxonomy. MWUs were categorised into literals, figuratives, ONCEs, and core idioms. Also, a new category was created, called outliers or specials, for items that do not fit within the taxonomy. Accordingly, the findings showed whether L1 - L2 congruency or semantic transparency are critical factors for choosing appropriate English MWUs to teach to native Persian speakers in a large-scale study explicitly.

Finally, Persian speakers' collocational knowledge was tested using the MWUs list. An effort was made to assess L2 learners from various proficiencies, and recent IELTS scores confirmed their proficiency level. Statistical analysis of the collected data was run via version 27 of SPSS. Bootstrapping, referring to resampling techniques, is a method to obtain reliable estimates of standard errors and confidence intervals (CI). Bootstrapping is particularly useful when the sample size is small or when making inferences about a population from a limited dataset (Haukoos & R. Lewis, 2005). It provides a way to approximate the sampling distribution of a statistic without making parametric solid

assumptions. Also, it is suitable as a substitute for parametric estimation when the assumptions of these methods are questionable (Donaldson, 2019). Also, bias-corrected and accelerated (*BCa*) intervals provide more accurate intervals (Haukoos & R. Lewis, 2005). Therefore, bootstrapping with standardised bias is considered when investigating all research questions.

Also, the relevant essential assumptions were tested to run any statistical analysis. In this regard, a quantitative approach is often taken to study the relationship between IELTS scores and academic performance using the Pearson correlation coefficient (C. Dang & T. Dang, 2023). The Pearson correlation coefficient (r) was conducted to find whether there is any correlation between Persian students' knowledge of MWUs and their proficiency level measured by IELTS scores,

In repeated measures analysis of variance (ANOVA), three or more levels of a within-subject factor are compared to determine whether there are any statistically significant differences among the means (Laerd Statistics, 2015). Hence, after meeting the required assumptions, repeated measures ANOVA was run to decide whether there were statistically significant differences between the frequency levels of MWUs in the productive knowledge test. In this regard, the general assumptions related to the research design include a continuous dependent variable and three or more levels of within-subject categorical factors. The normality of distribution and the assumption of sphericity are described during the statistical analysis.

The regression equation in standard multiple regression includes all the independent variables simultaneously. Alternatively, hierarchical multiple regression allows researchers to choose the order in which the independent variables are added to the regression equation. Consequently, several advantages are possible, including:

- Controlling for the effects of covariates
- Accounting for the possible causal effects of independent variables to predict a dependent variable (Laerd Statistics, 2015).

Therefore, standard multiple regression and hierarchical multiple regression with Persian students' IELTS scores as the dependent variable and frequency, L1 - L2 congruency, and semantic transparency as independent variables were utilised to determine if any correlation exists between these factors

3.8 Ethics and Politics

This replication research aligns with the scholarly vision of Associate Professor James Rogers, the originator of the MWUs list, with meticulous consideration given to potential copyright implications associated with its utilisation. The allocation of a singular research assistant pertained specifically to assessing inter-rater reliability for L1 - L2 congruency ratings, semantic transparency classification, and test scoring. Significantly, the research assistant's involvement did not extend to evaluating the literature review, writing processes, and statistical analyses.

The study's procedural transparency and ethical considerations are underscored by providing a participant information sheet (Appendix F) to all participants. This document is a comprehensive resource, furnishing individuals with essential details about the study's objectives, procedures, and any potential implications for their participation. Ensuring that participants are well-informed aligns with ethical standards and promotes a sense of trust and understanding in the research process.

In tandem with the participant information sheet, participants actively engaged in the ethical protocol by completing the consent form (Appendix E). This formal document serves as a tangible expression of their willingness to participate in the study, signifying an informed and voluntary agreement. Obtaining explicit consent acknowledges participants' autonomy, emphasising their right to make an informed decision about their involvement in the research. The provision of the participant information sheet and the completion of the consent form exemplify a commitment to ethical research practices. The study establishes a foundation built on respect and integrity throughout the research journey by prioritising transparency, communication, and participant autonomy.

The ethical framework of the research is robustly anchored in securing ethical approval. The supervisor diligently undertook this pivotal step and received the official endorsement of the Flinders University Social and Behavioural Research Ethics Committee (*Project number 4365*). The approval notice, a tangible testament to the adherence to ethical standards, is conveniently accessible in Appendix H.

3.9 Chapter Summary

This chapter outlines the design of the replication study, providing an in-depth overview of the research methods, procedures, and instruments employed. The approach to replicating a study on collocation errors, focusing on the impact of L1 interference, involves a contrastive analysis between different L1 languages and English, utilising Rogers's (2017a) inventory and steps. The study maintains consistency with the original research subjects but explores determinant factors and employs more complex statistical analyses. The present study diverges in test design, using semantic transparency for item selection and introducing variations in test formats. Additionally, the replication incorporates hierarchical regression analysis and repeated measures ANOVA for more in-depth statistical examination. Despite modifications, the conceptual replication contributes to the study's validity, offering insights into influential factors affecting collocation knowledge.

The research design unfolded across five distinct steps, each contributing to the comprehensive investigation of MWUs. The initial step involved a contrastive analysis of all MWUs, probing the congruency between the learners' L1 and the target language (L2). All items were translated into Persian for this step and rated via 12/12 system points. The second step involved classifying all MWUs based on a semantic transparency taxonomy. This classification sought to unveil the role of transparency in MWUs, thus establishing L1 - L2 congruency and semantic clarity as the pivotal criteria for selecting items worthy of direct teaching.

Building upon the insights gleaned from the first two steps, the third step involved leveraging the final results to pinpoint highly frequent MWUs deserving of focused teaching

and study efforts. These selections were informed by understanding the learning burden associated with each MWU. The fourth step translated the chosen MWUs into a digital resource for Persian-speaking learners. This resource served as a pedagogical tool, aligning with the identified criteria for explicit teaching.

The fifth and final step involved curating a balanced sample of MWUs to construct a productive test. This evaluative test assessed Persian students' knowledge of the selected items and outlined the learnability factors associated with MWUs. The chapter culminated with a summary of data analysis approaches and statistical perspectives, setting the stage for the detailed findings in the subsequent chapter.

CHAPTER FOUR ANALYSIS AND RESULTS

4.1 Introduction

The preceding chapter meticulously outlined the study's design, explaining the procedural steps, tool deployment, and statistical analyses required to address the research questions. Building upon this foundation, the current chapter synthesises the research scope (4.2), framing the anticipated contributions to the identified research inquiries. Following this, a comprehensive discussion of the analysis and the study's results are provided.

Section 4.3 serves as a focal point, encapsulating the essence of the contrastive analysis performed between Persian and English. A detailed summary is provided, with a subsequent comparative analysis drawn from the insights garnered through this linguistic examination. Section 4.4 meticulously outlines the classification of MWUs based on their semantic transparency. This classification system is expounded, shedding light on the layers contributing to understanding MWUs within the studied linguistic context.

Section 4.5 presents a comparative analysis that links the findings of Persian language learners' knowledge to the identified influencing factors. This section navigates the complex interplay of variables, offering valuable insights into the factors shaping learners' proficiency in MWUs. The final section provides a cohesive summary, encapsulating the key revelations and outcomes unearthed throughout the chapter. This synthesis sets the stage for understanding the research findings and their implications for the broader academic landscape.

4.2 Scope of the Research Questions

As mentioned in Chapter One, the scope of this study is twofold. First, this research tests whether L1 - L2 congruency or semantic transparency represent fundamental criteria for choosing useful English MWUs to teach native Persian speakers explicitly. The hypothesis behind this target is that the MWUs with low congruency need more teaching time. However, generic textbooks have been prepared instead of materials that adhere to this criterion.

Therefore, Rogers's (2017a) list of 11,212 high-frequency MWUs is analysed for L1 - L2 congruency and semantic transparency to determine the percentage of high-frequency MWUs. Consequently, the high-frequency MWU items selected in this research create a digital resource by answering these research questions:

1. To what extent should L1 - L2 congruency be a selection criterion for developing materials for Persian-speaking learners of English?
2. To what extent should semantic transparency be a selection criterion for developing materials for Persian-speaking learners of English?

Second, this research examines productive knowledge of collocations and the relationship between L1 – L2 congruency, semantic transparency, item frequency, and proficiency levels. The rationale behind assessing learners' knowledge is to improve language learning programs. Teachers may need to determine students' understanding of collocations based on various influential factors. Therefore, exploring L2 collocation knowledge may provide insight into teaching, learning, and designing curricula. Also, assessing learners' knowledge of collocations can help determine which items to include and which to consider in teaching and learning resources. Therefore, the following research questions were addressed:

3. Is there a relationship between knowledge of MWUs and Persian-speaking learners' L2 English proficiency?
4. To what extent does Persian-speaking L2 English learners' productive collocation knowledge change over MWU frequency levels?
5. To what extent do the frequency levels, congruency and transparency of MWUs predict Persian-speaking L2 English learners' proficiency?
 - a) How much variance in participants' IELTS scores is explained by the frequency of MWUs?
 - b) How much variance in participants' IELTS scores is explained by congruent and non-congruent MWUs?

- c) How much variance in participants' IELTS scores is explained by semantic and opaque MWUs?

This study follows two hypotheses (*H*) and formulates the following alternative hypothesis (*H_a*):

- *H_{a1}*: Persian-speaking L2 English learners obtain better scores for congruent collocations compared to incongruent collocations.
- *H_{a2}*: Persian-speaking L2 English learners obtain low scores for figurative collocations.

4.3 L1 - L2 Contrastive Analysis (*RQ1*)⁹

The SLA literature has documented that L1 – L2 congruence affects the learning and processing of L2 collocations (e.g., Boone et al., 2022). Evaluating the educational implications of the study suggested analysis and emphasis on direct attention to similarities and differences between L1 and L2 (e.g., Boone et al., 2022; Laufer & Girsai, 2008; Nesselhauf, 2005). Researchers can identify such items that can be prioritised for more teaching time. Providing a collocation resource and avoiding errors due to L1 influence can be achieved by ensuring L1 - L2 congruency. In contrast, focusing on incongruent collocations with L1 has long been emphasised (Bahns, 1993); only Rogers (2017a) attempted to create the L1 - L2 congruency resource for Japanese learners. The present research fills this gap by conducting an L1 - L2 contrastive analysis between Persian and English.

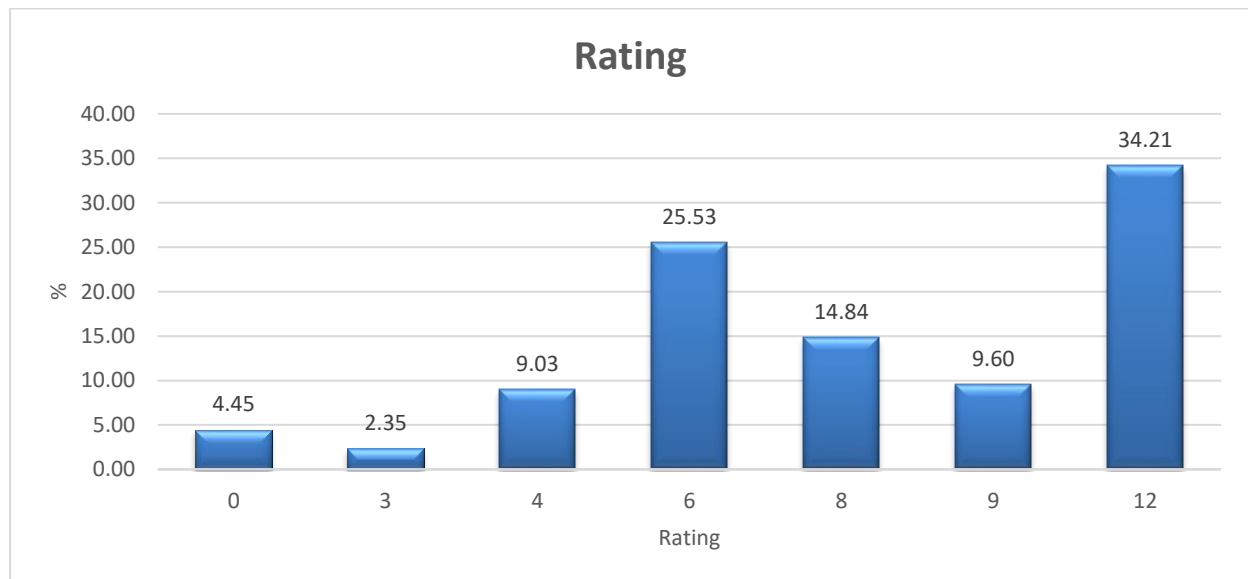
Therefore, the researcher, fluent in Persian and English, ran L1 - L2 congruency ratings on Rogers's (2017a) list with 11,212 English MWUs. The list was translated into Persian and analysed using the 12-point system to determine the percentage of MWUs

⁹ This section is adapted from Barghamadi et al. (2023). L1 - L2 Congruency as a criterion to identify collocations based on contrastive analysis.

based on L1 - L2 congruency and identify items with low L1 - L2 congruency (RQ1). Figure 10 demonstrates the percentage of these results (Review Appendix A).

Figure 10

Percentage of L1 - L2 Congruency Ratings of High-Frequency English MWUs with Persian Translation



Note: A rating of 12 illustrates total congruency.

As shown in Figure 10, 34.21% of MWUs (3,836) achieved a rating of 12 points. Thus, these items were congruent with the Persian translation. In comparison, 65.79% of MWUs (7,376) were classified between 0-9 ratings that were incongruent, to some extent, with Persian translation. In light of this, nearly two-thirds of the items posed a higher learning burden because their translations were incongruent. There is no doubt that L1 - L2 congruency is critical for Persian learners when choosing English items.

According to the literature review, incongruent collocations require more study time due to the higher learning burden. A list of items with a higher learning burden can be arranged according to L1 - L2 congruency, with more challenging items requiring additional study time or teaching. Also, learners could achieve fluency more efficiently if the volume of learning items were reduced, so a cut-off of 6 out of 12 points was used.

As a result, the 11,212 items were reduced to 46,368 items (41.35%), half of which significantly differed in translation. Such a list would be particularly beneficial for learners with limited time to study but who wish to concentrate only on items likely to cause errors. Appendix B provides a sample of every 100th MWUs identified as incongruent items with their Persian translations in this study. The full results of the high-frequency MWU items with low L1 - L2 ratings were used to create a digital resource.

Multiple assistances to translate and rate the list should have been utilised to ensure the reliability and validity of the procedure. However, the process was time-consuming and required people fluent in Persian and English; only one volunteer could be found as a second rater. Thus, the second rater rated 10% of the target items. The inter-rater reliability test found nearly 96% agreement between the two raters. Since inter-rater reliability has been shown to range between 75% and 90% (Stemler, 2004), the protocol for assigning L1 - L2 congruency ratings appears reliable.

4.4 Semantic Transparency Analysis (RQ2)¹⁰

Even though there is agreement on how much collocations have value, considerable disagreement still exists about what they should or should not be regarded as. Some researchers believe only frequently co-occurring words and semantically opaque words should be considered collocation (e.g., Moon, 1997; Van der Meer, 1998). Moreover, some researchers, such as Macis and Schmitt (2017b), note that it is essential to consider figurative meanings of collocation when teaching them. However, Shin (2006) reported that several researchers had not considered transparency as a criterion; he believed that it was essential to distinguish various types of collocations. Also, Wray (2000) claims that dealing with semantically transparent items is necessary to cover a wide range of MWUs.

¹⁰ This section is adapted from Barghamadi et al. (2023). The use of semantic transparency and L1 - L2 congruency as multi-word units selection criteria.

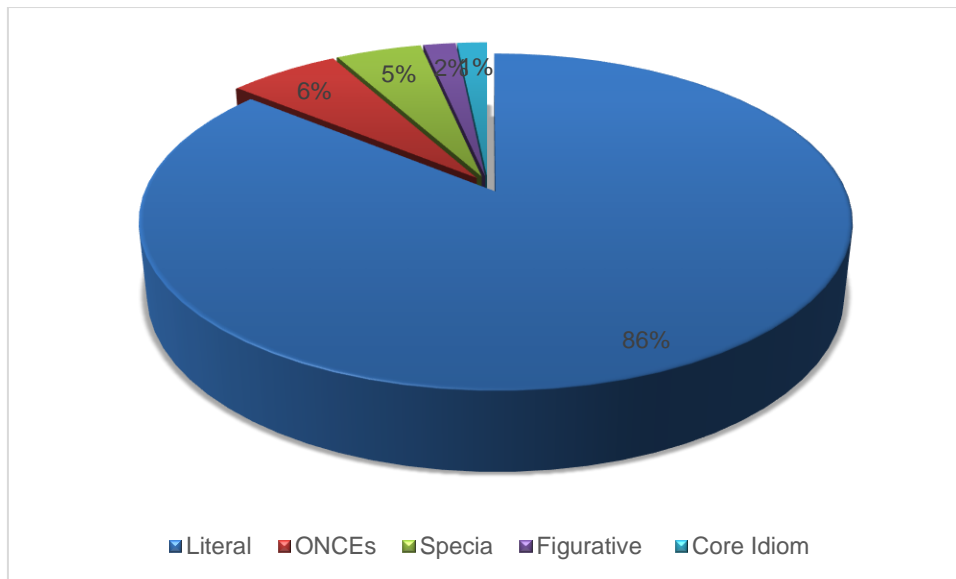
Therefore, semantic transparency might be another criterion for identifying MWUs. It makes sense as it helps narrow the identification selection process to only items that deserve more attention. Additionally, it is unclear to what extent high-frequency combinations are semantically transparent or opaque. This experiment provides insight into where the high-frequency collocations identified in this study fall on the continuum between compositional and non-compositional to help practitioners determine which particular items need more study time due to the increased learning burden with opaque meanings.

On the other hand, determining the level of compositionality is not easy (Shin, 2006). In this regard, Grant and Bauer's (2004) taxonomy is a simple classification. Several researchers stated that this classification of collocations into terms such as literal, figurative, ONCEs, and core idioms in language education is applicable (e.g., Nation, 2020; Shin, 2006). For instance, Shin mentioned that it primarily enables us to distinguish between "literals, which are compositional, and idioms and figurative, which are both non-compositional" (p. 33). When thinking about how to learn collocations, these contrasts are pretty significant.

For semantic transparency classification (RQ2), the researcher, along with another rater, used Grant and Bauer's (2004) taxonomy to determine whether or not the MWUs were literal, ONCEs, figurative, or core idioms. However, one classification called outliers or specials for items that fell outside the taxonomy, such as MWUs with polysemy issues (e.g., *bear children*), was added to this taxonomy. The subjective nature of assigning semantic transparency ratings can create reliability and replicability issues. However, in this current study, inter-rater reliability was 97%.

Figure 11

Semantic Transparency Classification of the Collocations Based on Grant and Bauer's (2004) Taxonomy



Two raters marked some items differently and were not literal and mostly figurative or core idioms. For example, *give him the benefit of the doubt* is classified as core idioms and figurative with different raters. The classification ignored the additional items since the literal is the main target. However, the researcher's view was still counted in the result. As illustrated in Figure 11, approximately 86% were literal or compositional items. To scrutinise the relationship between transparency and L1 - L2 congruency deeply, the researcher counted each item based on semantic transparency and congruency. The results of this part of the study can be seen in Table 13, which includes the addition of L1 - L2 rating categorisation (see Appendix C).

Table 13

Semantic Transparency Classification of the MWUs with L1 - L2 Rating Categorisation

L1 - L2 Rating	Literal (12)	ONCEs (8)	Special (6)	Figurative (4)	Core Idiom (0)
0-3	332	142	82	83	124
4-6	3,150	343	295	75	47
8-9	2,494	114	80	26	8
12	3,656	78	67	13	3
Total	85.9%	6.04%	4.68%	1.75%	1.63%

As relatively few items were judged to be ONCES, figurative, core idioms or outliers, if these categories were combined into one opaque category, 14.1% would fall into this category and 85.9% into the literal category. This result made it salient that many of the MWUs examined were classified into the literal category. As shown in Table 13, there was a positive relationship between L1 - L2 ratings and opaque meanings. As L1 - L2 congruency ratings increased, figurative and core idioms decreased. Also, the raters found 1% of items with literal and opaque meanings that Macis and Schmitt (2017b) call duplex collocations, such as *a piece of cake*, *the bottom line*, and the *inner circle*. These could be signals in the teaching process that some items have two meanings to consider (see example 1).

1. *Jack said that the test was easy. In fact, he said it was a piece of cake.*

The present research results show that most collocations follow a traditional word combination where two or more literal meanings can be added (A + B+ and so on). In contrast, the analysis showed that most items were somewhat incongruent with Persian. For example, *earn money*, *make sacrifices*, and *take a drink* have literal meanings but are incongruent with Persian (see below the sample examples).

2. *The girl wanted to earn money by working at a restaurant.*
3. *The painter became a famous artist, but he had to make sacrifices.*
4. *He took a drink of the alcohol.*

On the other hand, a tiny proportion of this study's sample collocations (1,518 items or 14.1%) had opaque meanings. The evaluation of these items indicated that only 161 were opaque but congruent with Persian. For example, *my heart stopped* was classified as figurative when the meaning refers to *it gives you a sudden intense feeling of fear*. However, it was congruent when word-for-word was equal to Persian and used in the same situation (see example 5).

5. *When the police told me that my wife was dead, my heart stopped.*

Therefore, the combination of both opaque items and duplex items made up 15.1% of the total items. In comparison, a substantial percentage of items in the present study were incongruent even after running a cut-off of 6 points (41%). These findings highlighted that L1 - L2 congruency could be a fundamental criterion for explicitly selecting items to be taught and studied.

4.5 Measuring Productive Knowledge of MWUs

A substantial body of literature reported that L2 learners have limited collocation knowledge. Considering corpus-based studies, evidence shows that productive knowledge of MWUs is challenging for L2 learners (e.g., Webb et al., 2013) since non-native essays contain about half the number of collocations as native ones (Laufer & Waldman, 2011). It seems that the L2 learners may avoid using certain collocations or overuse certain collocations they have mastered. In addition to corpus studies, paper-and-pencil tests of collocation knowledge reached the same conclusion that L2 learners have limited knowledge (e.g., González Fernández & Schmitt, 2015; Sonbul et al., 2022). Therefore, researchers have identified specific characteristics of some collocations, such as transparency and L1 - L2 congruency, that render them more difficult to learn than others.

Nevertheless, despite a variety of data highlighting these problems, there has not been a comprehensive resource that provides frequent, practical collocations regarded as deserving of direct teaching for assessing students (Rogers, 2017a). Generally, the previous research on measuring collocation knowledge has been focused on selected test items from the first three 1,000 frequency levels of English from Nation's (2012) BNC/COCA word families lists (e.g., Nguyen & Webb, 2017) or the first three 1,000 frequency levels from Davies' (2008) COCA frequency list (e.g., Sonbul et al., 2022). The present study took a different approach by utilising a list of innovative high-frequency MWUs derived from

lemmatised concgrams with 11,212 items (Rogers, 2017a). Therefore, the items were selected from a list with 3,000 lemma or word families in the previous studies; the present study's items were chosen from four frequency bands with approximately 2,800 items in each band.

As mentioned in sections 4.3 and 4.4, this current study categorised Rogers's (2017a) list based on L1 - L2 congruency and semantic transparency to explore the role of L1 - L2 congruency and semantic transparency in identifying high-frequency MWUs that Persian-speaking learners should focus on. That study found that most MWUs in the list consisted of literal formulations, and more items were incongruent to some degree with Persian as the L1 language. Therefore, the resulting custom-tailored list for Persian learners was used in this current study to create the MWU test.

The rationale behind measuring productive language skills instead of receptive knowledge is that productive knowledge is more demanding and more likely to result in more substantial learning than receptive knowledge (Nation, 2020, p. 23). Rogers (2017a) states that if receptive knowledge is tested first, the second test will be necessary to check productive knowledge. Consequently, this study implements a productive test in line with Laufer and Nation's (1999) C-test format. The list with L1 - L2 congruency rating and semantic transparency classification was divided into four frequency bands to select test items. Eight items were selected from each band. In brief, the L1 - L2 congruency rating was classified with 0-6 points for incongruent items and above six as congruent. Then, 16 items from each classification were selected to assess the congruency effect. Similarly, semantic transparency was classified as literal and opaque items (ONCEs, figurative, core idiom), then 20 items with literals and 12 from opaque MWUs were selected (see Chapter 3 for more details). Therefore, each item has two ratings: L1 - L2 congruency rating semantic transparency classification.

The results were analysed to determine if their IELTS scores affected their ability to answer the test and whether frequency, semantic transparency, or L1 - L2 congruency affected their knowledge of the items. Ethical approval for the research has been obtained

and granted by the Flinders University Social and Behavioural Research Ethics Committee to run the test. The next step was for all participants to consent to utilise their anonymised test data and IELTS scores in this study.

4.5.1 The Results of MWUs Test

The original number (N) of participants in the current study was 283 undergraduate and graduate students majoring in English. Twenty-seven outliers' data were removed due to missing their IELTS score and some blank sheets; therefore, the N-size became 256. The average proficiency level of participants was B2 to C1 based on CEFR (Council of Europe, 2001) according to their IELTS scores with a mean of 6.8, *BCa* 95% CI [6.7, 7], *SD*= .99, and *SE*= .036.

The MWUs test scores with 32 items had a high level of internal consistency, as determined by a Cronbach's alpha reliability coefficient of 0.88. The average of MWUs test scores with a mean of 20.75 (62.5%), *BCa* 95% CI [20.11, 21.24], *SD*= 5.41, and *SE*= .20 determined that the students had good knowledge of the test items since their average scores were above 50%. To address the last three research questions, the data were analysed to explore the relationship between Persian speakers' knowledge of MWUs and influence factors, including proficiency level, item frequency, congruency, and semantic transparency.

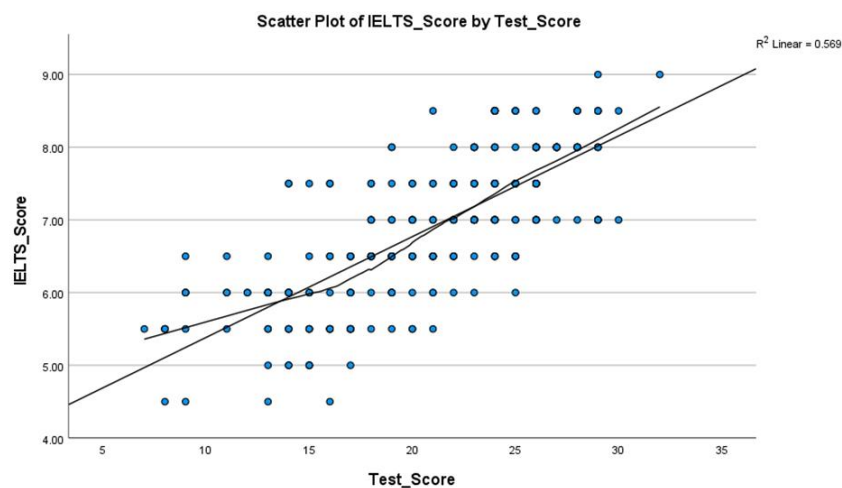
4.5.2 Proficiency Level and Knowledge of MWUs (RQ3)

The RQ3 of this study investigated whether there is any correlation between Persian students' knowledge of MWUs and L2 English proficiency levels (as measured by IELTS scores). This raises the question of whether IELTS scores are continuous or ordinal variables. In this regard, a quantitative approach is often taken to study the relationship between IELTS scores and academic performance using the Pearson correlation coefficient (C. Dang & T. Dang, 2023). Therefore, the correlation coefficient between two continuous-level variables is called Pearson product-moment or Pearson's *r* or correlation coefficient.

To choose between Pearson Product Moment correlation as a parametric statistic and Spearman rho as a non-parametric statistic, the skewness and kurtosis values were calculated and then divided by their standard error values to create the ratios. Since the ratios were not beyond ± 1.96 , it was decided that the data were not significantly deviant from the normal distribution and appropriate for Pearson Product moment correlation. The linearity of the relationship between the variables, an assumption of the Pearson Product Moment correlation, was checked through a scatterplot drawn for the two variables (Figure 12). The plot indicated that the dots were almost aligned straight, suggesting that the correlation was linear.

Figure 12

Scatter Plot for MWUs Test and IELTS Scores



Bootstrapping is a statistical method that generates several simulated samples from a single dataset (Haukoos & R. Lewis, 2005). It performs confidence intervals and provides standard errors for various sample statistics (Donaldson, 2019). Therefore, these statistical options were considered to run the correlation. Table 14 presents the Pearson correlation coefficients with consideration for bootstrapping. The results revealed that there was a strong and positive correlation with a large effect size (Frost, 2019) between proficiency and MWU test scores ($r(256) = 0.754$, BCa 95% CI [0.703, 0.80], $p < .001$, $R^2 = .57$). A significant

correlation coefficient in this research supports a possible parallel trend between EFL proficiency levels and MWUs knowledge.

Table 14

Pearson Correlation Between MWUs and IELTS Scores

	Pearson	Sig. (2-tailed)	Std. Error	Bias	BCa95% CI	
					LL	UL
IELTS Score- MWUs Test Score	.754	<.001	.024	-.001	.703	.798

4.5.3 Frequency Level and Knowledge of MWUs (RQ4)

The decision about which collocations to learn should be carefully considered since teaching all words and collocations is impossible. It may be helpful for teachers to identify which collocations at different word frequency levels are worth focusing on. Focusing first on high-frequency collocations would be beneficial since they are essential for communication. Therefore, the reason for using the frequency-based method is that it is necessary to utilise the most unbiased measurement possible to record the frequency of collocations to check learners' understanding of collocation at different frequency levels. Accordingly, Rogers's (2017a) list was divided into four groups (approximately 2,800), and eight items considering L1 - L2 congruency and semantic transparency classification were selected to examine knowledge of MWUs at different frequency levels.

Hence, a total score of 8 is possible for each frequency level. The descriptive statistics of participants' scores based on four frequency levels or bands (F1, F2, F3, F4) are demonstrated in Table 15. The table shows that the participants' mean scores decrease across the frequency level from a mean score of $5.90 \pm .11$, *BCa* 95 % CI [5.66, 6.15] in F1 (the most frequent MWU items) to a mean score (M) of $4.57 \pm .10$, *BCa* 95% CI [4.37, 4.79] in F4 (the least frequent MWU items). Determining whether participants did better on the higher frequency items than on the lower frequency items, the MWU test may be considered valid to a certain extent (Schmitt et al., 2001, p. 67).

Table 15*Bootstrapping Analysis of Mean Scores for the MWU Test by Frequency Level*

Variables	Mean	SE	BCa 95% CI	
			LL	UL
F1	5.90	.11	5.66	6.15
F2	5.20	.10	4.98	5.39
F3	5.07	.11	4.86	5.30
F4	4.57	.10	4.37	4.79

Note: Bootstrap results are based on 1000 Bootstrap samples.

An ANOVA with repeated measures was used to compare the means of three or more levels of a within-subjects factor where the participants were the same in each group. These four categories were compared via repeated measures ANOVA to check if the participants had different amounts of knowledge of each variety of MWUs (F1, F2, F3, F4). The reason for selecting this statistical analysis is rooted in the scores on all four categories coming from the same participants (repeated measures), and there are more than two categories (ANOVA). Therefore, a repeated measures ANOVA was run to determine whether there were statistically significant differences between their frequency levels in the productive knowledge test (RQ4). One of the assumptions of repeated measures is Sphericity via Mauchly's test.

According to Table 16, Mauchly's test of sphericity was statistically significant ($p < .05$). Hence, the assumption of sphericity was violated, $X^2(5) = 14.14$, $p = .015$. Therefore, the Greenhouse-Geisser row in Table 17 is interpreted. The values in this row show that the amount of MWUs knowledge over four categories of frequency was significantly different, $F(3, 765) = 54.56$, $p < .001$, $\eta^2 = .176$ with decreasing $M = 5.90$, BCa 95 % CI [5.66, 6.15] in F1 to $M = 4.57$, BCa 95% CI [4.37, 4.79] in F4.

Table 16

Testing the Assumption of Sphericity^a

Within				
Subjects	Mauchly's	Approx. Chi-		
Effect	W	Square	Df	Sig.
Frequency	.946	14.142	5	.015

Tests the null hypothesis that the error covariance matrix of the orthonormalised transformed dependent variables is proportional to an identity matrix.

a. Design: Intercept

Table 17 *Tests of Within-Subjects Effects*

Measure: Frequency Group							
Source		Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Frequency	Sphericity Assumed	230.401	3	76.800	54.560	.000	.176
	Greenhouse-Geisser	230.401	2.886	79.840	54.560	.000	.176
Error (Frequency)	Sphericity Assumed	1076.849	765	1.408			
	Greenhouse-Geisser	1076.849	735.878	1.463			

The pairwise comparisons or the post hoc test were performed since there are no prior hypotheses about whether particular levels of the within-subjects factor might differ. The Bonferroni post hoc test helps examine all possible pairwise combinations of levels of the within-subjects factor (Maxwell & Delaney, 2004). This test is helpful since it gives confidence intervals (also known as simultaneous confidence intervals) for the mean difference for each comparison and the statistical significance level (p-value) for each paired comparison (Laerd Statistics, 2015). Post hoc analysis with Bonferroni adjustment in Table 18 revealed that the difference was statistically significantly decreased from F1 to F2 (.70, 95% CI [.50, .90], $p < .001$), from F1 to F3 (.82, 95% CI [.59, 1.05], $p < .001$), from F1 to F4 (1.33, 95% CI [1.12, 1.53], $p < .001$), F3 to F4 (.5, 95%CI [.305, .695], but not from F2 to F3 ($M = 1.21$, 95% CI [-.09, .33], $p = 2.62$).

Table 18

Pairwise Comparisons

(I) Frequency	(J) Frequency	Mean Difference (I-J)	Std. Error	Sig. ^b	95% Confidence Interval for Difference ^b	
					Lower Bound	Upper Bound
1	2	.707*	.101	.000	.509	.905
	3	.828*	.117	.000	.598	1.059
	4	1.328*	.104	.000	1.124	1.533
2	1	-.707*	.101	.000	-.905	-.509
	3	.121	.108	.262	-.091	.333
	4	.621*	.099	.000	.425	.817
3	1	-.828*	.117	.000	-1.059	-.598
	2	-.121	.108	.262	-.333	.091
	4	.500*	.099	.000	.305	.695
4	1	-1.328*	.104	.000	-1.533	-1.124
	2	-.621*	.099	.000	-.817	-.425
	3	-.500*	.099	.000	-.695	-.305

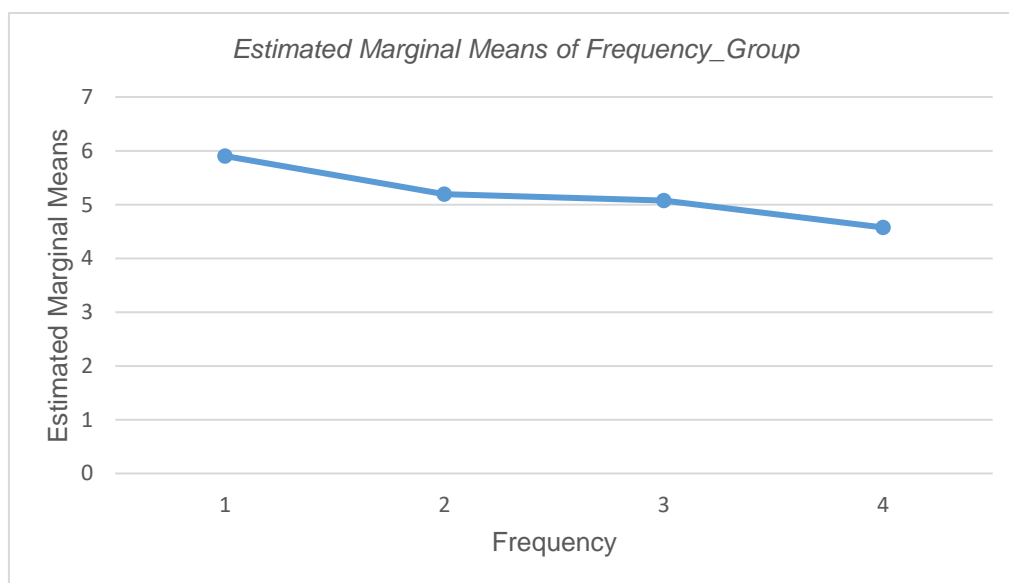
Based on estimated marginal means

*. The mean difference is significant at the .05 level.

b. Adjustment for multiple comparisons: Least Significant Difference (equivalent to no adjustments).

Figure 13

Estimated Marginal Means of Frequency Levels



Therefore, the participants had similar knowledge of MWUs from the F2 and F3 frequency levels. Also, their knowledge of MWUs in F4, the lowest frequency level, was insufficient compared to the other three frequency levels, based on Figure 13.

4.5.4 Association Between Knowledge of MWUs and Influential Factors (RQ5)

As reviewed, some factors affect collocation acquisition. Salient factors include semantic transparency, L1 - L2 congruency, item frequency, and learners' L2 proficiency (e.g., Boone et al., 2022; Ding & Reynolds, 2019; Fang & Zhang, 2021; Gyllstad & Wolter, 2016; Wolter & Yamashita, 2018). There are two reasons to explore these factors in the present study. One reason is that the previous research on measuring collocation knowledge has been focused on selected test items from the first three 1,000 frequency levels of English (e.g., Sonbul et al., 2022). Another reason behind this is that the current study's main objective is to identify high-frequency MWU items for teaching directly. Therefore, assessing influential factors is fundamental to determining items and providing teaching implications.

The mixed-effects models would be the best choice if the study aimed to investigate the collocation learning process. This model contains fixed effects and random effects. In contrast, the final RQ individually examined the relationships among influential factors. Therefore, RQ 5 (*To what extent do the frequency levels, congruency, and transparency of MWUs predict Persian-speaking L2 English learners' proficiency?*) was broken into sub-questions for each aspect. By considering bootstrapping, separate hierarchical multiple regression with Persian students' IELTS scores as the dependent variable and frequency, L1 - L2 congruency, and semantic transparency as independent variables were utilised to determine whether participants' IELTS scores correlated with their knowledge to answer the MWU test, also if any correlation exists between the variables of IELTS scores, item frequency, semantic transparency, and L1 - L2 congruency.

4.5.4.1 Relationship Between Frequency and Productive Knowledge of MWUs

In RQ4, a statistical trend was found that the decreased frequency level led to a decrease in correct responses across four levels of item frequency. In addition, Table 19 shows a positive and moderate correlation between MWU test scores and item frequency

level by considering bootstrapping. For instance, $F1r(256) = 0.8$, BCa 95% CI [0.75, 0.84], $p < .001$.

Table 19

Pearson Correlation with Bootstrapping for MWU Test Items Organised by Frequency Level

		F1	F2	F3	F4
MWU	Pearson Correlation	.800**	.792**	.772**	.826**
Test	Sig. (2-tailed)	.000	.000	.000	.000
Score	N	256	256	256	256
	Bootstrap ^b Bias	.000	.000	-.002	.000
	Std. Error	.022	.022	.028	.022
	95% Confidence Interval				
	Lower	.751	.745	.711	.779
	Upper	.842	.833	.819	.866

** . Correlation is significant at the 0.01 level (2-tailed).

b. Unless otherwise noted, bootstrap results are based on 1000 bootstrap samples

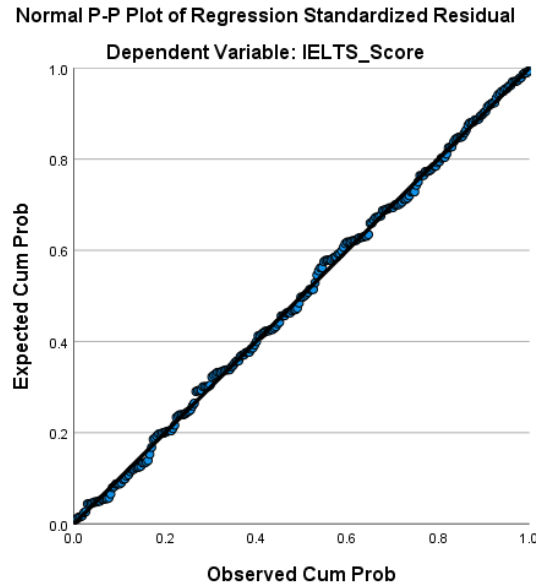
To explore how much variance in participants' IELTS scores was explained by the frequency of MWUs (RQ5a), hierarchical multiple regression was run to identify which groups of MWUs were significant predictors of IELTS scores, with the four frequency levels of MWUs as the independent variables and IELTS scores as the dependent variable. As one of the regression analysis assumptions, the independence of observations was checked using the Durbin-Watson test. The Durbin-Watson statistic was found to be 1.69, being very close to 2. Therefore, it was concluded that residuals were independent.

A linear relationship existed between the dependent variable and each independent variable by evaluating partial regression plots and a plot of studentised residuals against the predicted values. There was no evidence of multicollinearity, so the data points were not found to be related in a way that would affect the regression result, as assessed by correlation coefficients less than 0.8 and tolerance values over 0.1. Homoscedasticity was demonstrated by examining a plot of studentised residuals and unstandardised predicted values. There were no leverage values more than 0.2, no studentised deleted residuals bigger than three standard deviations, and no values for Cook's distance over 1, so overall,

the two groups had appropriately similar variability to each other. The Q-Q Plot met the normality assumption, showing a similar incremental value increase (Figure 14).

Figure 14

Normality of Standardised Residuals Between Frequency Levels



Accordingly, all assumptions of hierarchical multiple regression were met. A hierarchical multiple regression was run using the four frequency levels as independent variables to determine if MWU knowledge affected subsequent IELTS scores (Table 20). The first model with the most high-frequent MWU items was statistically significant $F(1, 254) = 161.16, p < .001$ and explained 38% of the variance in the IELTS score. After the entry of F2 (second-most frequent MWU items) in model 2, an additional 2.6% of the variance was presented. Adding F3 (third-most frequent MWU items) to the regression model explained an extra 13.5%, and this change in R^2 was significant, $F(3, 252) = 102.4, p < .001$.

Table 20

Hierarchical Multiple Regression Predicting IELTS Score from Frequency Levels

Model	Variable	B	β	Sig	BCa 95% CI		R^2	F	ΔR^2	ΔF
					LL	UL				

1	Constant	4.83		.00	4.51	5.12	.388	161.16	.388	161.16
	F1	.346	.623	.000	.30	.396				
2	Constant	4.56		.000	4.17	4.92	.414	89.4	.026	11.17
	F1	.287	.516	.000	.224	.350				
	F2	.120	.193	.001	.05	.194				
3	Constant	4.10		.000	3.75	4.46	.549	102.4	.135	75.65
	F1	.227	.409	.000	.180	.28				
	F2	.033	.054	.311	-.026	0.96				
	F3	.384	.427	.000	.20	.292				
4	Constant	4.06		.000	3.70	4.39	.607	96.91	.058	36.8
	F1	.127	.32	.000	.125	.233				
	F2	-.011	-.018	.725	-.069	.050				
	F3	.183	.315	.000	.129	.228				
	F4	.193	.326	.000	.134	.257				
	F4									

Note: Bootstrap results are based on 1000 Bootstrap samples.

Eventually, adding F4 (least frequent MWU items) to the regression model explained that the additional 5.8% of the variation in the IELTS score was significant $F(4, 251) = 96.91, p < .001$. The best predictor of the IELTS score was F4. The increase in one score of F4 led to a .193 *BCa 95% CI*, [.134, .257] increase in IELTS score. However, the final model with all four independent variables explains 60.7% of the variance = .607, Adjusted = .601. Nevertheless, F2 was not a significant predictor of the IELTS score in this model. Despite exhibiting a negative correlation (-.011), its contribution to the model was not statistically significant ($p = .725$).

Table 21*Regression Coefficients by Interaction Frequency*

Model		Unstandardized		Standardized		95.0% Confidence Interval for B			Correlations		Collinearity Statistics		
		Coefficients	Error	Coefficients	t	Sig.	Lower Bound	Upper Bound	Zero-order	Partial	Part	Tolerance	VIF
1	(Constant)	4.415	.277		15.94	.000	3.87	4.96					
	F1	.154	.032	.278	4.78	.000	.091	.218	.623	.290	.189	.463	2.161
	F2	-.037	.036	-.060	-1.03	.304	-.108	.034	.480	-.065	-.041	.463	2.158
	F3	.164	.031	.282	5.23	.000	.102	.225	.629	.314	.207	.536	1.866
	F4	.159	.039	.268	4.08	.000	.082	.236	.668	.250	.161	.361	2.773
	Interaction_ Frequency	.000	.000	.153	1.52	.128	.000	.000	.715	.096	.060	.155	6.455

a. Dependent Variable: IELTS Score

Moreover, interaction refers to a situation where the relationship between two variables is a function of a third variable called a moderator. That is, the strength of the relationship between two variables can increase or decrease because of another variable. However, this model was statistically significant, $F(5,250) = 78.4$, $p < 0.001$, but the interaction between frequency levels and IELTS scores was not significant ($t = 1.52$, $p = .128$) according to Table 21. In other words, the strength of the relationship between each independent variable and the dependent variable was not dependent on the levels of the other independent variable. For instance, the effect of the highest frequent items (F1) was due to the value of this level and was not influenced by different groups.

4.5.4.2 Relationship Between Congruency and Productive Knowledge of MWUs

The MWUs test, with 32 items, consists of 16 congruent and incongruent items. A total score of 16 is possible for each category. Table 22 illustrates the descriptive statistics of participants' scores based on congruency. The results revealed that the participants' mean score for congruent items ($M = 11.27$, $BCa\ 95\%CI [10.94, 11.60]$) was higher than for

incongruent items (M= 9.48, BCa 95%CI [9.10, 9.86]), supporting the first alternative hypothesis (H_{a1}).

Table 22

Descriptive Statistics of Mean Scores for MWUs Test Organised by Congruency

Variables	M	SE	BCa 95% CI	
			LL	UL
Congruent	11.27	.17	10.94	11.60
incongruent	9.48	.20	9.10	9.86

Note: Bootstrap results are based on 1000 Bootstrap samples.

Multiple regression with congruent and incongruent MWUs as the independent variables and IELTS scores as the dependent variable was run to identify which groups of MWUs based on congruency were significant predictors of IELTS scores (RQ5b). Table 23 illustrates that the Durbin-Watson statistic was 1.65, suggesting that residuals were independent.

Table 23

Model Summary of Congruency and IELTS Scores

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.703 ^a	.494	.492	.70922	
2	.755 ^b	.570	.567	.65500	1.651

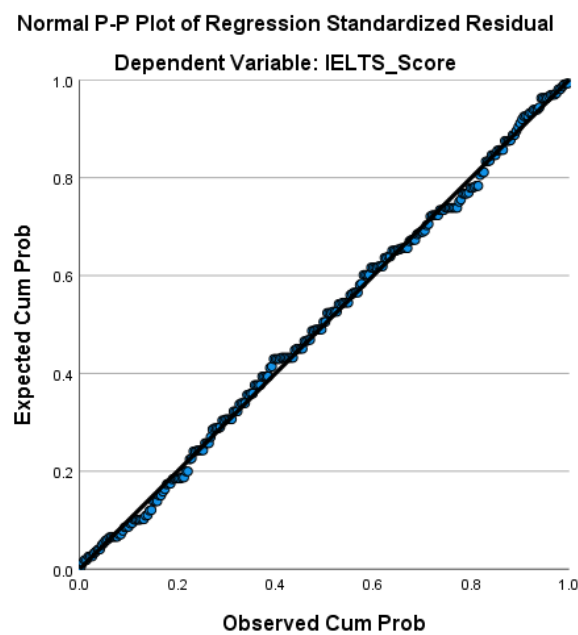
- a. Predictors: (Constant), Congruent
- b. Predictors: (Constant), Congruent, incongruent
- c. Dependent Variable: IELTS Scores

The linearity of the relationship between the dependent variable and each independent variable was checked using partial regression plots. The results indicated a linear relationship between the independent and dependent variables. There was no multicollinearity, as assessed by correlation coefficients less than 0.8 and tolerance values over 0.1. Homoscedasticity was demonstrated by examining a plot of studentised residuals

and unstandardised predicted values. There were no leverage values more than 0.2, no studentised deleted residuals bigger than three standard deviations, and no values for Cook's distance over 1. The Q-Q Plot met the assumption of normality (Figure 15).

Figure 15

Normality of Standardised Residuals for Congruency



As Table 24 shows, the multiple regression model fits the data well. This is reflected in the values of R Square (.570) and Adjusted R Square (.567). The R Square value of .570 indicated a large effect size, suggesting that the independent variables could explain 57% of the variance in the dependent variable.

Table 24

Multiple Regression Results for Congruency

Model	Variable	B	β	SE B	BCa 95% CI		R^2	F	ΔR^2
					LL	UL			
	Constant	3.94	-	.178	3.39	4.29	.570 ^a	167.91	.567

Congruent	.155	.416	.022	.11	.19
incongruent	.125	.398	.019	.08	.16

Note: Bootstrap results are based on 1000 Bootstrap samples.

a. Predictors: (Constant), Incongruent, congruent

b. Dependent Variable: IELTS Score

As displayed in Table 25, the overall model was found to be statistically significant, $F(2, 253) = 167.915, p < .001$, indicating that the independent variables (i.e., congruent and incongruent MWUs) collectively significantly predicted the dependent variable (i.e., IELTS scores). The regression coefficients for congruent MWUs (.155) and incongruent MWUs (.125) and their respective p -values ($p < .001$) showed that both of the independent variables added significantly to the prediction. That is, their contribution to the model was statistically significant.

To examine the interaction effects, congruent by incongruent were multiplied to create the interaction variable (Congruent*Incongruent) to be included in the model. Since there was a high correlation between the congruent and interaction variables and the incongruent and interaction variables, the original variables were converted to centred variables and used in the analysis to avoid multicollinearity. Therefore, there is no evidence of multicollinearity in centred variables.

Table 25

Model Summary Organised by Interaction Congruency

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.762 ^a	.580	.575	.64894	1.632

a. Predictors: (Constant), Interaction Centered, Incongruent Centered, Congruent Centered

b. Dependent Variable: IELTS Score

Table 26*Table of ANOVA Organised by Interaction Congruency*

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	146.500	3	48.833	115.958	.000 ^b
	Residual	106.124	252	.421		
	Total	252.624	255			

a. Dependent Variable: IELTS Score

b. Predictors: (Constant), Interaction Centered, Incongruent Centered, Congruent Centered

Table 27 and Table 28 show that the interaction between congruent and incongruent (Congruent*Incongruent) was statistically significant. It accounted for substantial variance in the dependent variable, $F(3, 252) = 115.95$, $p < 0.001$ ($t = 2.39$, $p = .017$), corresponding to an increase in the R-squared of the model without interaction from 57% to 57.5% for the model with interaction (see Table 26).

Table 27*Regression Coefficient Organised by Interaction Congruency*

Model	Variable	B	β	t	Sig.	BCa 95% CI	
						LL	UL
1	Constant	6.80	-	136.7	.000	6.7	6.9
	Congruent-Centred	.167	.45	7.43	.000	.123	.21
	Incongruent-Centred	.126	.40	6.82	.000	0.90	.16
	Interaction-Centred	.011	.104	2.39	.017	.002	.021

a. Dependent Variable: IELTS Score

Since the interaction variable was found to be significant, two possibilities were tested through scatterplot:

1. Congruent (as moderator) moderated the relationship between incongruent and IELTS scores.
2. Incongruent (as moderator) moderated the relationship between congruent and IELTS scores.

Figure 16

Scatterplot Incongruent with IELTS Score by Group Congruent

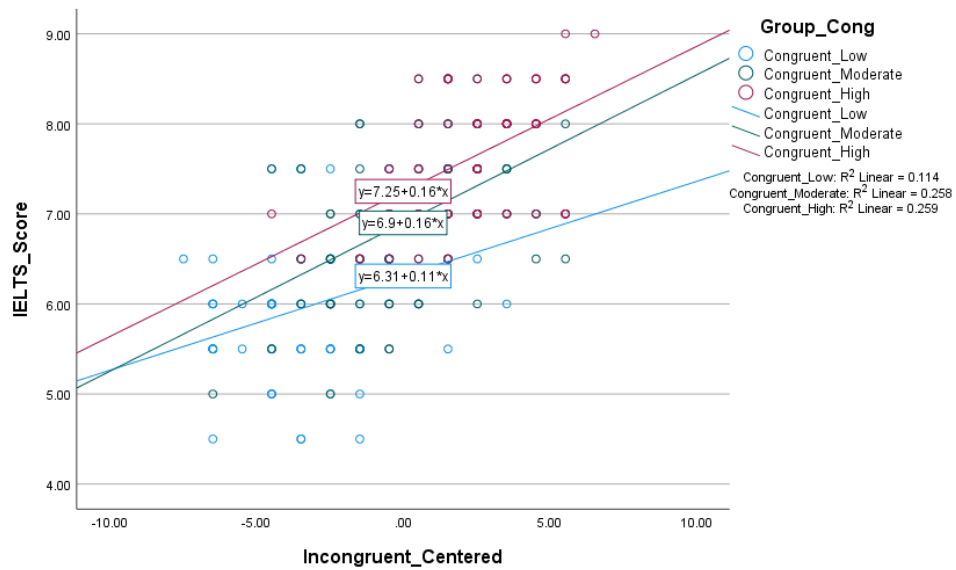
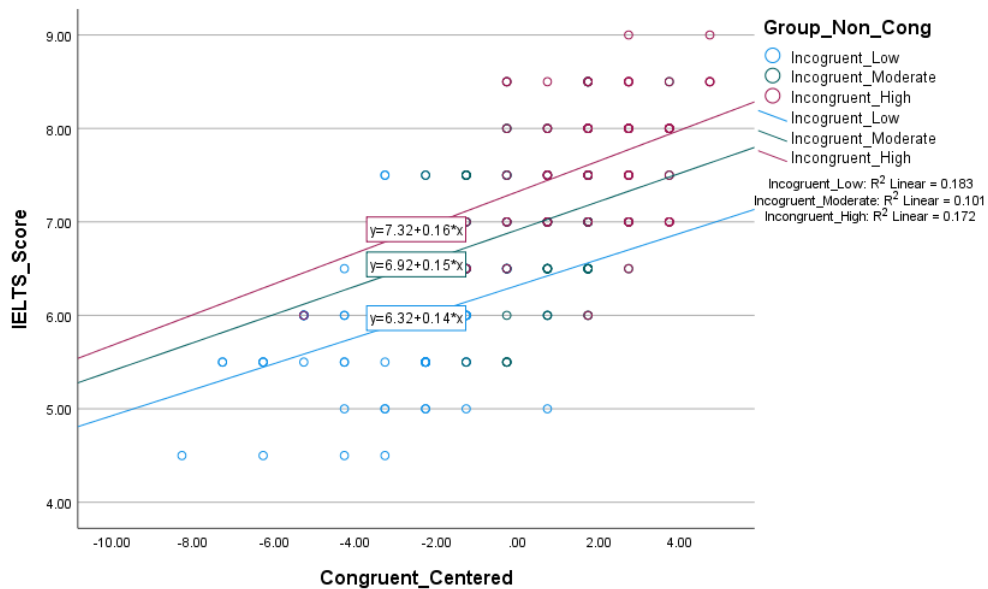


Figure 17

Scatterplot Congruent Centred with IELTS Score by Group Incongruent



As can be seen from the scatterplot in Figure 16, the relationship between incongruent and IELTS increases as the level of knowledge of congruent increases (R values in the right part of the diagram). However, as Figure 17 shows, there is no visible pattern. The relationship between congruent and IELTS scores is stronger when incongruent

is lower (0.183) and higher (0.171). This relationship is weaker for a moderate level of incongruent (0.101).

In this segment, this research explored two potential scenarios due to the absence of a predetermined plan. Typically, when dealing with actual interaction effects, the initial step involves formulating hypotheses about which variable acts as a moderator and which remains independent. Unfortunately, a theoretical perspective made this analysis unattainable. Consequently, the study treated congruence as the moderator in the first and incongruence as the moderator in the second design. The initial model illustrates that as the understanding of congruence deepens, the relationship between incongruence and IELTS scores intensifies. Essentially, proficiency levels rose with increased knowledge of incongruence; conversely, the second design with incongruence as the moderator did not exhibit any discernible pattern.

4.5.4.3 Relationship Between Transparency and Productive Knowledge of MWUs

The MWUs test with 32 items consisted of 20 semantic transparency items and 12 opaque items. Since the number of items was unequal, normalisation was considered via the percentage. The descriptive statistics of participants' scores based on transparency are illustrated in Table 28. The results revealed that the participants' mean score for opaque items ($M=58\%$, Bca 95% CI [55.4, 60.4]) was lower than semantic transparency ($M= 69\%$, Bca 95% CI [66.4, 71.4]), supporting the second alternative hypothesis (H_{a2}).

Table 28

Descriptive Statistics of Mean Scores for MWUs Test Organised by Transparency

		Semantic transparency	Opaque
Raw Data	Mean	13.7	6.9
	SE	.24	.13
	<i>BCa</i> 95% CI [LL, UL]	[13.3,14.27]	[6.6,7.1]
Percentage	Mean	68.9	57.9
	SE	1.1	1.1
	<i>BCa</i> 95% CI [LL, UL]	[66.4, 71.4]	[55.4, 60.4]

Note: Bootstrap results are based on 1000 Bootstrap samples.

Multiple regression analysis was run to identify which groups of MWUs based on transparency were significant predictors of IELTS scores (RQ5c), with semantic and opaque MWUs as the independent variables and IELTS scores as the dependent variable. The assumption of observation independence was assessed using the Durbin-Watson test, as shown in Table 29. The test was very close to 2 (i.e., 1.67). Therefore, it was concluded that residuals were independent.

Table 29

Model Summary Organised by Transparency

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.674 ^a	.455	.453	.73644	
2	.766 ^b	.587	.584	.64198	1.675

a. Predictors: (Constant), Semantic

b. Predictors: (Constant), Semantic, Opaque

c. Dependent Variable: IELTS Score

Partial regression plots were used to examine the linearity of the relationship between the dependent variable and each independent variable. The relationship between the independent variables collectively (i.e., semantic and opaque MWUs taken as one) and the dependent variable was also linear, as displayed in the scatterplot produced by plotting the studentised residuals against the unstandardised predicted values. Additionally, there was homoscedasticity, which was checked using the same scatterplot. The spread of residuals did not exhibit a visible pattern, suggesting homoscedasticity.

There was no evidence of multicollinearity, which was checked using correlation coefficients and tolerance values. The correlation coefficient between semantic and opaque MWUs was less than .8 (Table 30 suggesting that they were not highly correlated). The results for tolerance values, with both being greater than .1 and their respective VIF values (lower than 10), further confirmed no significant correlation between the two variables. Then, it was concluded that there was no multicollinearity. The normality assumption was assessed using a Q-Q plot of the standardised residuals. The results are displayed in Figure 18. Since

the points were aligned along the diagonal line, it suggested that residuals were normally distributed.

Table 30

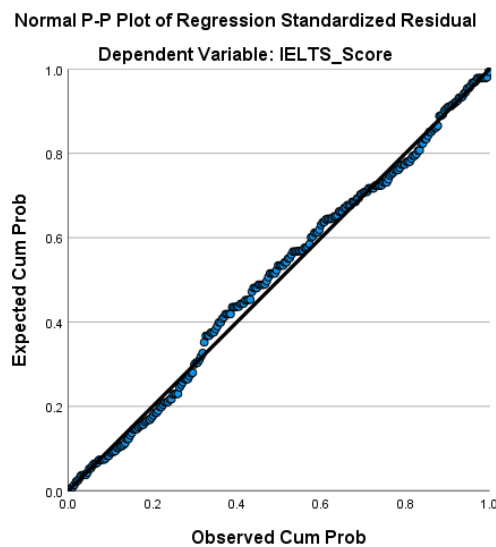
Regression Coefficients and Collinearity Statistics for Independent Variables

Model		Unstandardised		Standardised		Correlations			Collinearity Statistics		
		B	Std. Error	Beta	t	Sig.	Zero-order	Partial	Part	Tolerance	VIF
1	(Constant)	4.006	.159		25.182	.000					
	Semantic	.100	.014	.381	7.350	.000	.674	.419	.297	.607	1.648
	Opaque	.213	.024	.467	9.013	.000	.706	.493	.364	.607	1.648

a. Dependent Variable: IELTS Score

Figure 18

Normality of Standardised Residuals for Transparency



According to Table 31, the multiple regression model statistically significantly predicted the IELTS score, $F(2,253) = 179.86$, $p < .001$, $adj. R^2 = .58$. Examination of the regression coefficients for semantic MWUs ($B = .020$, $BCa95\%CI [.015, 0.26]$) and opaque

MWUs ($B = .026$, $BCa95\%CI [0.20, .031]$) and their respective p-values ($p < .001$) indicated that both of the independent variables added significantly to the prediction of the model. Both semantic and opaque MWUs were significant predictors of IELTS scores, but opaque MWUs had a more significant unique effect with the β weight .467.

Table 31

Multiple Regression Results for Transparency

Model	Variable	B	BCa 95% CI for		β	SEB	R^2	F	ΔR^2
			LL	UL					
1	Constant	4.0	3.68	4.31		.15	.587	17./86	.584
	Semantic	.020	0.15	.026	.382	.003			
	Opaque	0.26	.020	0.31	.467	.003			

Note: Bootstrap results are based on 1000 Bootstrap samples.

To examine the interaction effects, semantic transparency by opaque was multiplied to create the interaction variable (Semantic *Opaque) to be included in the model. Since there was a high correlation between the semantic transparency and interaction variables and the opaque and interaction variables, the original variables were converted to centred variables and used in the analysis to avoid multicollinearity; therefore, there is no evidence of multicollinearity in centred variables. After meeting all assumptions, the multiple regression was run. However, this model was statistically significant, $F(3,253) = 119.63$, $p < 0.001$, but the interaction between semantic transparency and opaque was not significant ($t = .388$, $p = .69$), as shown in Table 32.

Table 32

Regression Coefficients and Collinearity Statistics for Independent Variables

Model	Unstandardised Coefficients	Standardised Coefficient		Sig.	Correlations	Collinearity Statistics
		s	t			

		B	Std. Error	Beta		Zero-order	Partial	Part	Tolerance	VIF	
1	(Constant)	6.86	.048	-	141.90	.000	-	-	-	-	
	Semantic Centered	.102	0.14	.386	7.24	.000	.674	.415	.293	.577	1.73
	Opaque Centered	.213	0.24	.467	8.9	.000	.706	.493	.364	.607	1.65
	Interaction	.002	.005	.016	.388	.69	-.169	.024	.016	.923	1.08

a. Dependent Variable: IELTS Score

In other words, the analysis reveals significant main effects for semantic transparency and opacity, but their interaction effect is insignificant. This suggests that semantic transparency's impact is primarily attributable to its inherent value and is not significantly influenced by its opaque nature, and vice versa. These findings provide insight into the independent effects of semantic transparency and opacity on the outcome, highlighting their distinct contributions to the observed results.

4.6 Chapter Summary

Following an overview of the research questions, this chapter describes the findings of each research question in detail. A summary of each research question and the results is provided in this section.

1. To what extent should L1 - L2 congruency be a selection criterion for developing materials for Persian-speaking learners of English?

This study found that 65.79% of MWU items were not congruent with their Persian counterparts to some extent. As a result, this criterion plays a crucial role when selecting high-frequency MWUs for direct studies. Also, L2 learners can reduce errors derived from their L1 influence by spending extra time teaching such items.

2. To what extent should semantic transparency be a selection criterion for developing materials for Persian-speaking learners of English?

All non-literal items were combined in one group, as the opaque group comprised 14.1%. In comparison, a substantial percentage of most items in the present study were literal (85.9%). It will be interesting to see how these results compare to the perspective of some researchers who believe that literal collocations should not be explicitly taught. This study reveals a new perspective on selecting and explicitly preparing MWU items.

3. Is there a relationship between knowledge of MWUs and Persian-speaking learners' L2 English proficiency?

The results revealed a strong and positive correlation with a large effect size between proficiency and knowledge of MWUs ($r(256) = 0.754$). Therefore, knowledge of collocations/MWUs improves as EFL proficiency increases.

4. To what extent does Persian-speaking L2 English learners' productive collocation knowledge change over MWU frequency levels?

The participants' mean scores decreased across the frequency level, from 5.90 in the most frequent group (F1) to a mean score of 4.57 in the lowest frequency level (F4). The results determined whether participants did better on the higher-frequency items than the lower-frequency items.

5. To what extent do the frequency levels, congruency and transparency of MWUs predict Persian-speaking L2 English learners' proficiency?

This question was divided into sub-questions to answer this RQ and scrutiny of variables. Regarding the effect of frequency, the best predictor of proficiency measured by IELTS score was the lowest frequency or F4, followed by F1 as the highest frequency item. Therefore, less frequent MWUs are less likely to be acquired. On the other hand, the interaction between frequency levels was not significant. It means that the effect of each group is due to its value and is not influenced by other levels.

The results also revealed that the participants' mean score for congruent items was higher than for non-congruent items. The beta weight showed that congruent items (.416) added more to the prediction than incongruent items. In this light, if congruence is a

moderator, the relationship between incongruent and IELTS increases as the level of knowledge of congruence increases. However, if incongruent is a moderator, there is no visible pattern. These results demonstrated that IELTS scores improve as the knowledge of non-congruent items increases.

Moreover, the current research findings revealed that the participants' mean score for opaque items was lower than semantic transparency. However, no interaction effects were observed; semantic and opaque MWUs were significant predictors of IELTS scores, but opaque MWUs had an even more substantial impact. Consequently, achieving more proficiency requires moving from high-frequency to low-frequency words. Additionally, direct attention toward congruency and transparency is essential, particularly to incongruent items at low levels of learning.

CHAPTER FIVE DISCUSSION

5.1 Introduction

It is widely recognised that learning MWUs is essential for fluency (Boers, 2020), and knowledge of such items enhances communication (Boers, 2020; Szudarski, 2017). The MWUs are the building block of the written and spoken contexts of English speakers (L1), and to achieve a high level of communication, idiomaticity is recognised as a fundamental factor (e.g., Durrant & Schmitt, 2009; Nation, 2001; Williams, 2002). Since the literature indicates that a large proportion of MWUs are in spoken and written discourse (e.g., Erman & Warren, 2000), knowledge of these could facilitate L2 learning. Although it is considered that MWUs should be part of L2 pedagogy (e.g., Pellicer-Sánchez, 2020), several studies found that MWUs were ignored in L2 materials (e.g., Boers et al., 2017).

Collocation dictionaries are available but tend to be overwhelming for users (Kjellmer, 1994). The evaluation of collocations lists indicated that MWU lists tend to focus on academic collocations (e.g., Ackermann & Chen, 2013; Durrant, 2009; Lei & Liu, 2018; Rogers et al., 2021; Simpson-Vlach & R. Ellis, 2010). Although several studies have been conducted to create new resources for general English, evaluating these resources revealed little guidance on how and which MWUs should be prioritised and selected when creating materials. Such factors include non-transparent or non-compositional MWUs (e.g., Martinez & Schmitt, 2012) and grammatical well-formedness (e.g., Shin, 2006).

While researchers claim that hundreds of thousands of collocations exist in L1 English speakers' mental lexicons, the resources available to study and teach these collocations are generally limited. For example, Martinez and Schmitt's (2012) list, with 505 items and Shin's (2006) list, with 1000 items, are small-scale sizes for general English. Rogers (2017a) developed a novel concordance method to identify approximately 3,000 high-frequency MWUs in general English by incorporating some disadvantages of other corpus-based studies for Japanese learners. This research endeavoured to create a new resource for Persian learners by following Rogers's steps.

The need for more resources specifying useful collocations can be attributed to the immense number of items researchers have to handle. Besides the lack of sufficient collocation resources, evidence shows that L2 learners have difficulty acquiring them. As Boers and his colleagues (2014) and Henriksen (2013) pointed out, collocational competence is not developed by even advanced L2 learners for several reasons. This is mainly because L2 learners are not exposed to various contexts that enable them to recognise collocations (Durrant & Schmitt, 2009). Also, both teachers and L2 learners seem to focus on single words, which indicates that learners rely on the open choice instead of the idiom principle (Men, 2018; Sinclair, 1991). When idiomatic expressions are used, learners need help comprehending their overall meaning (Martinez & Murphy, 2011). Therefore, it poses another issue when the individual meaning of word combinations cannot provide comprehension of the whole combination and then a context due to semantic transparency.

Martelli (2006) mentioned that choosing which collocations should be described and taught is one of the most challenging aspects of dealing with collocations. The research also noted that identifying learners' difficulties while using collocations is essential to choosing collocations through studying the L2 learners' collocation mistakes. Several researchers have observed reasons for errors in L2 collocation production (e.g., Davoudi & Behshad, 2015; Nesselhauf, 2003, 2005; Şen, 2019; Wang & Shaw, 2008). It has been widely observed that L2 learners make errors due to L1 influences or transferring L1 collocational patterns to the L2 in various contexts (e.g., Şen, 2019; Wang & Shaw, 2008). Also, some studies reported that the synonym strategy was a reason for producing deviant collocations (Davoudi & Behshad, 2015). However, few studies considered using these determining factors to select items and create collocational materials (e.g., Rogers, 2017a). Therefore, assessing the impact of L1 on developing ELT materials is reasonable.

Additionally, a sizable corpus of research has been compiled to investigate the factors influencing L2 collocation knowledge, including item-related and learner-related variables (e.g., Nguyen & Webb, 2017; Vu & Peters, 2021). In this regard, the salient item-related variables consist of congruency and frequency, and the prominent learner-related

variables are knowledge of single words and proficiency levels. Despite their importance, the findings regarding these variables have been inconsistent, highlighting the need for further research to reach a universal conclusion. For example, while congruency and frequency were expected to impact learning outcomes significantly, the inconsistencies suggest that additional factors may be at play. By identifying the complexities of these variables, educators can tailor instructional approaches and interventions better to support learners' language acquisition and proficiency development. Future research should continue to explore these variables and their interactions to refine our understanding of effective language learning strategies and instructional practices. However, despite these inconsistencies, the evidence generated from this research provides valuable insights for pedagogy.

Different approaches were emphasised in pedagogical implications when looking more closely at the teaching implications of collocation research. Some researchers recommend the importance of making L2 learners aware of collocations, such as differences and similarities, via contrastive analysis and pointing out collocations whose translations do not have direct equivalence between the two languages (e.g., Bahns, 1993; Boone & Eyckmans, 2023; Laufer & Girsai, 2008; Peters, 2009). On the other hand, some evidence emphasised that since opaque items have a higher learning burden, the focus must be on these items for EFL/ESL learners (Macis & Schmitt, 2017a; Martinez & Schmitt, 2012; Shin & Chon, 2019).

Until this point, most collocation research has concentrated on describing collocational performance and analysing how L2 learners utilise collocation. As the previous studies show, collocations are a topic many L2 learners find challenging (e.g., Boers et al., 2014). Consequently, several empirical studies have focused on how collocations can be taught in language classes (e.g., Webb & Kagimoto, 2009). In contrast, only some studies attempted to create collocation resources based on L2 difficulty. Therefore, the main goal of this study is to develop a general English collocation resource for Persian speakers. The first step was to explore whether L1 - L2 congruency or semantic transparency are fundamental

criteria for selecting useful English MWUs. This research looks into the matter to determine if L1 - L2 congruency or semantic transparency are essential criteria for choosing effective English MWUs to teach to native Persian speakers explicitly in a large-scale study.

As a starting point, Rogers's list (2017a) with 11,212 high-frequency MWUs was used to examine the proportion of such items based on L1 - L2 congruency and semantic transparency. Then, to confirm the influential factors on learning L2 collocation — including frequency, L1 - L2 congruency, semantic transparency, and proficiency — a productive collocations knowledge test was developed using Rogers's list to assess Persian speakers' knowledge. This chapter compiles all of these results, connects them to the objectives of this thesis, and thoroughly explains how the findings have addressed the thesis's objectives. This chapter provides detailed descriptions of the results in line with its research objectives and research questions.

5.2 Multi-Word Units Selection Criteria (RQ1-2)

Even though collocations play a crucial role in fluency development, they are widely acknowledged to be difficult for learners to produce (e.g., Nesselhauf, 2003). Therefore, it should be prominent in L2 pedagogy, and more attention should be paid to creating materials. In this regard, empirical collocational research explored L2 learners' performance in producing collocation and reported that L1 interference was the main reason for a significant proportion of errors. The error analysis studies may be actuated to conduct more research based on L1 - L2 congruency.

As reviewed in the literature review section, there is an agreement that semantic transparency and congruency contribute to the processing of collocations (e.g., Sonbul et al., 2023). Also, semantic transparency could be associated with the congruency effect in collocation processing (Yamashita, 2018). Therefore, congruency or the presence of L1 equivalents for L2 word combination and semantic transparency or how literal/figurative an MWU is as MWU selection criteria were investigated in the current research to determine

whether L1 - L2 congruency or semantic transparency are fundamental criteria by answering RQ 1 and RQ2:

1. To what extent should L1 - L2 congruency be a selection criterion for developing materials for Persian-speaking learners of English?
2. To what extent should semantic transparency be a selection criterion for developing materials for these Persian-speaking learners of English?

Considering contrastive analysis, 11,212 English MWUs identified by Rogers (2017a) were translated into Persian and rated via the 12/12 system points. The findings of this study clarified the crucial role of *L1 - L2 congruency* in language learning, particularly for Persian learners of English (RQ1). With 34.21% of MWUs (3,836) achieving a rating of 12 points, it became evident that these items were well-aligned with the Persian translation. This congruency suggested that learners find these items comprehensible and conducive to effective language acquisition. However, most MWUs, accounting for 66% (7,376) of the total, were classified with ratings between 0-9, indicating some incongruence with the Persian translation. This disparity underscores a significant challenge faced by Persian learners, as these incongruent translations can pose a higher learning burden.

As discussed in the literature review, few studies conducted a contrastive analysis to observe L1 - L2 congruency (Rogers, 2017a; Shin, 2006). However, Shin (2006) noted that L1 - L2 congruency was required to attend. He conducted a contrastive analysis on approximately 10% of his items (500 out of 4,500). Rogers (2017a) was noticeably more thorough. As a result, the current study only used one significant piece of literature as a direct point of comparison. Upon comparing the findings of this study with those of Rogers's analysis, notable differences emerge in the congruency between English and Persian translations, as compared to English and Japanese translations. Specifically, this study found that 41% of the items were rated 0-6 for English-Persian translations. In comparison, Rogers reported a lower percentage of 30.5% for English-Japanese translations when applying a cutoff of 6 out of 12.

These disparities in the study's findings may be attributable to the rating process, which included the attribution of half points for some collocations. The study rated collocations based on their congruency with the Persian translation, considering potential deviations if Persian learners utilised synonym words. For instance, *world policy* instead of *global politics* could influence the rating assigned to a specific collocation. Such differences in translation equivalency may contribute to the higher incongruency observed between Persian and English compared to Japanese and English translations. Future research should further investigate the impact of translation equivalency on collocation ratings and explore strategies to mitigate these disparities.

While few studies investigated L1 - L2 congruency for creating collocation resources, substantial literature explored the effect of congruency in various contexts. For instance, the results of studies by Yamashita and Jiang (2010) in the Japanese context, Wolter and Gyllstad (2011) in the Swedish context, Peters (2016) in the Dutch context, and Davoudi and Behshad (2015) in the Iranian context all came to the same conclusion. For instance, Yamashita and Jiang (2010) conducted a real-time task to assess the acceptability of phrases. The study involved native English speakers, Japanese ESL users, and Japanese EFL learners, tested on congruent and non-congruent collocations. Participants read stimuli on a computer screen and quickly indicated their acceptability by pressing Yes or No on a keyboard. The results revealed that both EFL and ESL learners made more errors with non-congruent collocations than congruent ones. Furthermore, EFL learners exhibited slower responses to non-congruent collocations than congruent ones. These results indicate that learning incongruent collocations poses a more significant challenge than their congruent counterparts, leading to a higher frequency of errors among learners.

In another study, Wolter and Gyllstad (2011) conducted a primed Lexical Decision Task involving two groups: native English speakers serving as controls and L1 Swedish learners of English. The task comprised three conditions for baseline data: congruent collocations, non-congruent collocations, and unrelated items. The primary objective was to explore the occurrence of collocational priming and investigate the influence of L1

knowledge on the processing of L2 collocations. The results unveiled significant differences in reaction times between collocations and unrelated items for the native speaker group, indicating that words prime their collocates. Noteworthy findings emerged for non-native speakers concerning their responses to congruent and non-congruent collocations. Firstly, congruent collocations exhibited more priming than non-congruent ones, with the latter being responded to more slowly than the former. Secondly, for non-congruent collocations, no significant difference in error rates was observed compared to congruent collocations. The studies underscore the significance of congruency or non-congruency between L1 and L2 as potentially the “biggest barrier in L2 collocational processing”(Gyllstad & Wolter, 2016, p. 318).

The role of congruency is well documented in SLA research for English learners and recognised as a critical issue for translation trainees and those learning other languages (Boone & Eyckmans, 2023; Sonbul et al., 2022). A growing body of literature has examined collocation as challenging for translators, mostly incongruent items (Haghighi & Hemmati, 2018; Sonbul et al., 2022). In a recent study by Sonbul et al. (2022), the dynamics of collocational proficiency in English-to-Arabic translation tasks were unveiled. The research found that the interplay between congruency and the recall of linguistic forms significantly influences the ability to produce acceptable collocations in a translational context. The findings from this study carry practical implications for language education, particularly in the domain of translation classes. Sonbul and her colleagues recommended a pedagogical approach, advocating explicit attention to incongruent and opaque collocations. By doing so, educators can better equip learners to navigate the practicalities of translation, fostering a more comprehensive understanding of collocational nuances in both source and target languages. This targeted emphasis aims to enhance learners' proficiency in rendering collocations accurately and contextually, thereby contributing to a more robust foundation in translation skills.

Regarding the role of congruency in other languages except for English, Boone and colleagues (2022) investigated the effect of corpus frequency, L1 - L2 congruency,

imageability, and association strength in a longitudinal study with 50 Dutch (L1) undergraduate students majoring in German. They found that in a mixed-effect model, there was a significant effect between congruency and time. The findings suggested that teachers and material developers emphasise congruency with particular attention to incongruent items. In another study, Boone and Eyckmans (2023) examined the effect of L1 - L2 congruency over five months of studies in German countries with 45 Dutch (L1) undergraduate students majoring in German. The pre and post-tests of a gap-filling of 50 collocations were run to assess the participants. The results revealed that the participants in German countries obtained more incongruent collocations. Regarding pedagogical implications, Boone and Eyckmans (2023) suggested raising learners' awareness of similarities and differences between L1 and L2 based on contrastive analysis and translation. In addition, they recommended increasing L2 exposure and translating word combinations instead of word-for-word.

The most significant impact on learning appears to be the lack of congruence between L1 and L2. Therefore, such items should receive more teaching time (e.g., Chan & Liou, 2005), and emphasis on non-congruent collocations should be increased (e.g., Wolter & Gyllstad, 2011). Surprisingly, teaching materials still need to address this criterion despite its importance. In case most collocations are incongruent, it would be reasonable to emphasise L1 - L2 congruency. The findings of this study support the use of L1 - L2 congruency as a criterion in the development of English language learning materials for Persian-speaking students.

Consequently, the study underscores the importance of considering L1 - L2 congruency in developing collocational resources and identifying MWUs. Notably, the research posits that incongruent collocations pose a heightened challenge for learners compared to their congruent counterparts. These revelations prompt a call for teaching materials prioritising L1 - L2 congruency and advocating for creating comprehensive collocational resources. The explicit teaching of incongruent items is recommended, particularly for educators seeking to enhance the learning experience. For learners

constrained by limited study time, a curated list spotlighting items demanding increased attention proves beneficial. Accordingly, L1 - L2 congruency could be crucial in identifying MWUs and creating a collocational resource.

On the other hand, *semantic transparency* could be another criterion for identifying MWUs. Some scholars mentioned that L2 learners focus on non-transparent items rather than literal combinations since semantic transparency is crucial (e.g., Gyllstad & Wolter, 2016; Macis & Schmitt, 2017a, 2017b). This perspective has supported that non-compositional MWUs should be considered collocations (e.g., Moon, 1994) and are valuable to create an MWUs list based on this criterion (Martinez & Schmitt, 2012). Nevertheless, focusing only on non-transparent items may not be appropriate because most collocations are semantically transparent (Rogers, 2017a).

Accordingly, one way to define MWUs is by classifying collocations. Generally, all the classifying criteria of collocations have come from studies based on the phraseological approach. Researchers (Grant & Nation, 2006; Nation, 2020) agree that it is helpful to classify the collocations into literal, figurative, and core idioms in language learning. The classification of MWUs based on semantic transparency provides valuable insights into the interplay between linguistic structure and meaning within translation equivalence. Therefore, all the items in Rogers's (2017a) list were classified into literal, ONCE, figurative, core idioms and outliers using Grant and Bauer's (2004) taxonomy. By measuring the percentage of semantically transparent items, the value of the selection criteria can also be confirmed (RQ2: *To what extent should semantic transparency be a selection criterion for developing materials for these Persian-speaking learners of English?*).

Across all the items examined in this study, most MWUs (85.9%) were classified as literal translations, indicating a direct correspondence between the linguistic form and meaning in both languages. This finding is significant and highlights the fundamental aspect of translation equivalence. The current study's findings are similar to those of previous studies, which found that most items examined were literal (e.g., Grant, 2005; Macis & Schmitt, 2017a; Rogers, 2017a). Specifically, in a small-scale study, Macis and Schmitt

(2017b) classified 54 collocations into literal collocations (78%) and figurative collocations (22%). In contrast, they stated that when teachers teach collocations, it is essential to consider figurative meanings when they use collocations. Also, Grant (2005) found that there are only 103 semantically opaque multi-word items in the British National Corpus (BNC), and none appear often enough to be included in a list of the 5,000 most frequent word families.

In this study, the data has shown that only 14.1% of the MWUs analysed could be categorised as ONCE, figurative, core idiom, and outliers. These categories, referred to as opaque items, represent a minority of the dataset. This finding underscores the prevalence of literal patterns among most of the MWUs examined in the study. Additionally, it was significant to identify duplex collocations, which make up 1% of the items with literal and opaque meanings in the current study. These collocations, such as a *piece of cake*, *the bottom line*, and *the inner circle*, exhibit literal and idiomatic interpretations. They not only illustrate the complexity of language but also challenge traditional categorisations.

Contrary to Moon (1994,1997), who noted that literal items are not required to be studied by L2 learners directly, this research found that the high ratio of items from a large-scale study was literal. In such a scenario, if learning the literal meaning of items does not require learners to consider the meanings of the collocations as long as they comprehend the meanings of the component words, why is learning collocations challenging for L2 learners since most items in this study had literal formations? While understanding the individual meanings of words can help learners grasp the literal meaning of phrases or sentences, mastering collocations requires more than just understanding individual words.

Collocations are fixed combinations of words that frequently occur together in natural language, and they often have specific connotations that may not be immediately obvious from the meanings of the component words alone. It cannot be easy to know which words arbitrarily go together when understanding the meaning of a phrase, for instance, to recognise why *full* comes with *Moon* and not *total* or *whole*. In this regard, Shin and Chon (2019) claim that L2 learners have difficulty with all types of word combinations with different levels of transparency, and therefore, such items also deserve study time. However, they

noted that focusing on non-compositional MWUs can be particularly beneficial for language learners, especially when they have limited time available for study.

According to this study, opaque items and duplex collocations, constituting a mere 15% of the total MWUs examined, present a challenge when considering their inclusion in the dataset or MWU list. Limiting the dataset to opaque items and duplex collocations would exclude most items, rendering it impractical for analysis or use in language learning materials. These findings highlight the limitations of relying solely on opaque items and duplex collocations for dataset construction. Instead, a more comprehensive approach that includes a broader range of MWUs is necessary to ensure the dataset's usefulness and applicability in language research and pedagogy. Therefore, limiting the dataset only to opaque items and duplex collocations is not a viable option.

While few empirical studies considered semantic transparency, such as Gyllstad and Wolter (2016), the evidence indicated that transparency plays a role in collocational processing. In this regard, Gyllstad and Wolter classified their target collocation based on Howarth's (1998) model. However, they considered two types of word combinations: free combinations as literal items and collocation or restricted collocations. They tested 27 Swedish learners of English (NNSs) and 38 English-speaking as a control group (NSs) to determine whether free combinations and collocations were processed differently. According to the results, both NNSs and NSs showed the transparency effect when responding to free combinations in the phrase acceptability judgment task more quickly and accurately than collocations. It is worth mentioning that Gyllstad and Wolter (2016) only considered congruent collocations.

In another study, Sonbul et al. (2023) examined 92 Arabic-English translators and found that they would provide a natural translation for congruent and transparent over incongruent and opaque collocations. Therefore, Sonbul and her colleagues emphasised the importance of raising the level of training for translators to become aware of the congruency and semantic transparency features of collocations. These studies indicated that the emergence of more complex semantic transparency categories in higher proficiency levels

highlights the dynamic nature of language acquisition and the importance of exposure to diverse linguistic forms for fostering proficiency and cultural understanding.

Furthermore, the distribution of MWUs across semantic transparency categories demonstrates significant variability depending on the L1 - L2 rating categorisation. In the lower L1 - L2 rating categories (0-3), there was a noticeable trend towards more complex semantic transparency categories, such as ONCEs, Figurative, Core idioms, and Special, as opaque items (431 items) to compare literal formulations (332 items). These categories indicate deviations from literal translations and indicate the presence of subtle meanings that require a deeper understanding of context. Conversely, as the L1 - L2 ratings increased, indicating a higher level of congruency between the languages, there was a noticeable shift towards a higher prevalence of MWUs classified as literal translations and a reduction in opaque items. This shift underscores a direct correspondence between the linguistic form and meaning in both languages, indicating a more substantial alignment between Persian and English collocations. These findings highlight the importance of considering the level of congruency between languages in understanding the formation and comprehension of MWUs.

The results of this study were following Yamashita's (2018) research. Yamashita classified 240 collocations across five experimental studies, neatly dividing them into congruent and incongruent categories. Upon scrutinising the outcomes, a discernible trend emerged: transparent items overwhelmingly populated the congruent category, while opaque items asserted dominance in the incongruent category. This observation strongly hints at semantic influence in shaping congruency's impact. As a result, revealing the most effective pedagogical techniques for imparting these items to learners becomes a pressing endeavour.

According to Macis and Schmitt (2017b), most collocation pedagogy and textbooks focus on combining words with literal meanings. Therefore, the primary focus centres on the explicit and concrete associations formed by combining words that directly align with their conventional definitions. This tendency underscores a broader inclination within educational

resources to prioritise the comprehension and usage of collocations characterised by straightforward and tangible semantic connections. While this approach certainly addresses a foundational aspect of language learning, it also prompts reflection on the potential implications of sidelining or underemphasising collocational usage's more abstract and figurative dimensions.

Consequently, it becomes evident that both opaque and incongruent items are often overlooked or inadequately addressed in L2 instructional materials. The oversight in treating these linguistic elements in L2 materials is expected, given the varied detection and definition approaches employed by different analytical techniques in collocation study. The inherent diversity in how collocations are identified and understood underscores the need for more comprehensive resources encompassing this perspective. Considering the sophisticated nature of collocations and their varied complexities, there arises a necessity for more substantial guidance directed towards educators and material creators. This guidance should assist them in discerning elements that hold particular significance for L2 learners, offering a roadmap for including opaque and incongruent items in instructional materials. As the field continues to evolve, there is a growing demand for more information and materials to comprehend the semantic opacity of MWUs thoroughly. Furthermore, teachers stand to benefit immensely from access to textbooks and supplementary materials explicitly designed to aid them in selecting the most crucial and challenging MWUs for L2 learners. Such resources could provide valuable insights into effective teaching strategies, offering practical approaches to navigating opaque and incongruent collocations. Thus, it enhances the overall educational experience for instructors and learners alike.

In conclusion, this study's findings emphasise the critical importance of L1 - L2 congruency for Persian learners of English. Nearly two-thirds of the items assessed posed a higher learning burden due to incongruent translations, highlighting the need for targeted interventions to address this issue. By prioritising L1 - L2 congruency in language learning materials and instructional practices, educators can empower learners to navigate the complexities of the target language more effectively. When employing a large-scale corpus-

based list, the identification of MWUs with low congruency between Persian (L1) and English (L2) is facilitated using a cut-off threshold six. MWUs below this threshold represent specific linguistic areas where learners may face difficulties and where further attention is needed in language teaching and learning contexts. Identifying such MWUs can shed light on instances where there may be notable discrepancies or challenges in translation or language transfer between the two languages being compared. Through this process, we can better understand the specific linguistic challenges that learners may encounter and use this knowledge to improve language teaching and learning outcomes.

5.3 Determinants of MWUs Knowledge (RQ3-5)

The consensus among L2 lexical acquisition researchers is that vocabulary knowledge contributes to overall proficiency (Zareva et al., 2005), and the degree of MWUs knowledge of L2 learners predicts L2 vocabulary knowledge (Crossley et al., 2015). Cowie (1998) defines *phraseological competence* as a level of proficiency comparable to that of a native speaker. Since L2 proficiency depends on collocational knowledge (Vu & Peters, 2022b), it should be emphasised in the L2 curriculum (Pellicer-Sánchez, 2020). Despite the amount of accumulated research on the role of MWUs, L2 learners have problems with collocation production, even for high proficiency level learners (e.g., Estaji & Hashemi, 2022; Laufer & Waldman, 2011; Men, 2018; Nesselhauf, 2003; Zhou, 2016).

More specifically, Men (2018) conducted a corpus-based cross-sectional study on one million words by Chinese EFL learners across five proficiency levels to investigate verb+noun, noun+noun, and adjective+noun collocations. Men's findings indicated that there is a phenomenon of 'collocational teddy bears' in Chinese L2 learners who heavily use a small number of collocations, such as "*make + progress*", "*make + mistake*", "*take + care*", "*do + homework*" (Men, 2018, p. 81). However, the researcher noted that since some of these combinations are not equivalent to their L1 or Chinese language (e.g., *make + progress*) and English speakers commonly use these expressions in everyday conversation, the overuse of specific collocations or 'collocational teddy bears' is not an L2 learners' issue.

Contrary to Men's view, Granger (1998) found that combinations often used by French learners generally had an equivalent translation in their L1. In contrast, varieties incompatible with their L1 were seldom utilised.

This evidence may prove that L2 learners tend to overuse collocations that they are familiar with, referring to "collocational teddy bears" (Nesselhauf, 2005, p. 69), "safe bets" (Granger, 1998, p. 148), and "islands of reliability" (Dechert, 1983, p. 184). On the other hand, the footprint of L1 is confirmed when L2 learners tend to overuse word combinations with congruent or equivalent translations in their L1. While the studies mentioned earlier are based on exploration in error analysis research, controversial recent studies have examined influential factors in the collocational learning process among diverse contexts. As described in the introduction and related literature review sections, the learning difficulty of MWUs can be explained by several factors, consisting of item-related and learner-related variables. The salient items-related variables include congruency, semantic transparency and frequency (e.g., Fang & Zhang, 2021; Nguyen & Webb, 2017; Peters, 2016). The prominent learner-related variables are knowledge of single words and proficiency levels (Sonbul et al., 2022; Vu & Peters, 2021).

Regarding all attempts, their findings were mixed due to different targets and contexts. Hence, reaching a comprehensive conclusion could be inevitable. However, there are some advantages to assessing collocation knowledge. Careful consideration should be given to whether collocations are worth spending time on, although teaching some is possible. Finding valuable items and an efficient teaching method is required. Also, assessing learners' knowledge is intended to improve language learning programs. Teachers may need to consider various influences when determining students' understanding of MWUs. Therefore, learning L2 MWUs and designing curricula may be improved by exploring L2 MWUs knowledge. Assessment of learners' knowledge of MWUs can also help determine the items to include in teaching and learning resources.

Given the limited research on the combined effect factors, further study is needed since their findings still need to be conclusive. While previous research aims to explore the

influential factors and investigate the collocation learning process, the present research intended to confirm these salient significant factors for creating a new resource for Persian learners. Therefore, a secondary objective of this study was to examine the variables related to learners and items that may influence MWU learning. These findings confirm which collocations are worthy of the time and willingness to direct instruction. The current study aimed to investigate productive knowledge of MWUs at 11,212 MWU items elicited from COCA by utilising Rogers's (2017a) high-frequency MWU list based on the lemmatised concgramming method. The test items were produced considering L1 - L2 rating, semantic transparency, and item frequency. Based on the analyses and findings discussed in Chapter 4, the following subsections discuss the effects of proficiency, frequency, congruency, and semantic transparency on productive knowledge of the MWUs test.

5.3.1 L2 Proficiency Effect

Lexical proficiency is a constituent element of language learning (David, 2008), including word knowledge components such as single words and MWUs (Nation, 2013). Language users with excellent MWU knowledge are often considered proficient by their peers (Bestgen, 2017). The evidence shows that collocational knowledge is part of L2 proficiency since research has demonstrated that MWUs play an essential role in improving fluency, accuracy, and proficiency in languages (Shin & Chon, 2019; Wray, 2002) and enhances the naturalness and proficiency of language use (Hoey, 2005). Therefore, to aid L2 learners in improving their lexical competence, existing research in collocational knowledge has sought to investigate the effect of L2 proficiency on L2 learners' collocation knowledge in various contexts, such as Chinese, French, Japanese, Swedish, and Vietnamese English learners (e.g., Ding & Reynolds, 2019; Fang & Zhang, 2021; Men, 2018; Paquot, 2018; Vu & Peters, 2022a; Wolter & Yamashita, 2018; Yamashita & Jiang, 2010).

In light of the proficiency effect, some researchers claimed that collocation performance did not increase when collocation knowledge was compared among learners at different levels since the intermediate and advanced learners created considerably more incorrect collocations than the beginner learners (e.g., Laufer & Waldman, 2011). According

to this perspective, collocation knowledge does not improve as much as learners' overall level of English proficiency. In another view, some researchers reported a positive correlation (e.g., Keshavarz & Salimi, 2007). However, Ding and Reynolds (2019) found a connection between L1 congruency and L2 proficiency. Their study revealed that high-proficiency Chinese–English bilinguals, specifically English majors, demonstrated significantly higher accuracy on congruent collocations and faster speed in judging incongruent collocations than their low-proficiency counterparts, non-English majors. Surprisingly, there were no other significant differences between the two groups in response time for congruent collocations or in their accuracy for incongruent collocations. These unexpected results suggest that the relationship between learners' L2 collocational knowledge and proficiency is not straightforward and is influenced by L1 congruency. In other words, improving L2 proficiency does not always lead to better mastery of L2 collocational knowledge and vice versa. These findings underscore the need for further research in this area.

From a pedagogical point of view, exploring the relationship between proficiency levels and collocational knowledge could lead to two conclusions that provide valuable insight into how to teach based on their difficulties. First, to find if there is a positive or negative correlation between proficiency and collocational knowledge. Second, it could reveal the significant issues that different levels of English proficiency confront with collocational knowledge. Therefore, this study investigated whether there is a relationship between knowledge of MWUs and Persian-speaking learners' proficiency via utilising Rogers's (2017a) MWUs list. Since IELTS is one of many high-stakes standardisation tests available for assessing the proficiency of L2 learners, the proficiency level of the target group was recognised by collecting their IELTS scores.

Pearson correlation coefficients considering bootstrapping were run to answer RQ3 (Is there a relationship between knowledge of MWUs and Persian-speaking learners' L2 English proficiency?). The results revealed a strong and positive correlation with a large effect size between Persian-speaking learners' proficiency as indicated by IELTS scores and

knowledge of MWUs ($r(256) = 0.754$). Therefore, knowledge of collocations/MWUs improves as EFL proficiency increases. The result is in line with results recorded in previous research, suggesting that proficient language users are familiar with various collocations since they correlate positively with L2 proficiency (e.g., Al-Zahrani, 1998; Estaji & Hashemi, 2022; Keshavarz & Salimi, 2007; Koosha & Jafarpour, 2006; Sonbul et al., 2023; Vu & Peters, 2022b).

In this regard, Al-Zahrani (1998) observed a significant correlation between the Saudi EFL learners' lexical collocations and their language proficiency, as determined by the TOEFL test. A similar link was observed between the L2 proficiency of 100 Iranian EFL learners and collocations knowledge in Keshavarz and Salimi's (2007) research. The results of the cloze test and collocation tests have relatively high and positive correlations, implying that learners' levels of collocational knowledge and proficiency were positively related.

Similarly, Koosha and Jafarpour (2006) assessed 200 Iranian students majoring in English via translation tasks focusing on collocation and appropriate prepositions. Because collocation knowledge correlates to learners' proficiency levels, the authors propose that it could be used to measure proficiency. Alongside the findings of this study, Estaji and Hashemi (2022), in a corpus-based study, scrutinised 100 academic writing (task two) in the mock test by Iranian IELTS candidates. They classified different types of phraseological units from 26,423 words based on Moon's (1998) taxonomy. During the IELTS writing task 2, simple formulae dominated the phraseological units used particularly by low-scoring candidates. Also, band scores increased along with the ranges and numbers of complicated phraseological units. A summary of the interview data also showed that candidates with high band scores had a more robust understanding of phraseology.

With a substantial sample size of 256 participants in the current study, the correlation coefficient of 0.754 indicates a robust and positive association, highlighting the importance of MWUs in assessing language competence among this demographic. The significance of comprehending the interrelationships of words within a linguistic context cannot be overstated. Various studies presented in this section have consistently noted a strong

association between collocational knowledge and language proficiency. This recurring finding underscores the crucial role that collocational knowledge plays in language acquisition and proficiency across diverse learner populations. It is evident that proficiency in recognising and utilising collocations firmly correlates with overall language competence. Thus, comprehending and employing collocations is vital to language acquisition and proficiency.

Consequently, in the last decade, most L2 collocational processing research has explored the effect of L2 proficiency along with other factors such as congruency (e.g., Ding & Reynolds, 2019; Sonbul & El-Dakhs, 2020; Wolter & Yamashita, 2018), frequency (e.g., Fang & Zhang, 2021), and L2 exposure (Yamashita & Jiang, 2010). However, drawing any conclusions from these studies is challenging since their findings were mixed. For instance, Ding and Reynolds (2019) found that Chinese-English speakers with a high level of proficiency had significantly higher accuracy on congruent collocations and significantly faster speed in judging incongruent collocations than those with low-level proficiency. In contrast, the two bilingual groups' response times for congruent collocations and their accuracy on incongruent collocations did not differ. Consequently, they concluded that L1 congruency influences the L2 collocational knowledge and the relationship between L2 proficiency level and collocational knowledge is not collinear.

The results of Yamashita and Jiang's (2010) study and Sonbul and El-Dakhs's (2020) research were inconsistent with Ding and Reynolds's (2019) findings. Sonbul and El-Dakhs's (2020) investigation revealed that Saudi EFL learners' collocation knowledge correlated with their proficiency, and the congruency effect was reduced with increased proficiency level. Also, Yamashita and Jiang found that the L1 - L2 congruency effect was diminished for Japanese speakers with higher L2 proficiency levels and more L2 exposure. Wolter and Yamashita (2018) found contradictory findings in a study that differed from those previously evaluated. They suggested that for Japanese-English speakers with more exposure to L2 and higher degrees of L2 proficiency, the L1 - L2 congruency effect is not diminished. This contradicts previous findings and underscores the importance of considering factors such as

exposure to L2 and proficiency levels in understanding the dynamics of L1 - L2 congruency effects. These findings suggest that the relationship between L1 and L2 congruency may vary depending on individual language learning experiences and proficiency levels, highlighting the need for further research.

In addition, Fang and Zhang (2021) examined 60 Chinese–English learners and reported a non-linear relationship between collocational knowledge and L2 proficiency. They suggested that collocational learning and L2 competency progress at various rates. This result is in agreement with Ding and Reynolds (2019). This non-linear relationship underscores the complex nature of collocational acquisition and its interaction with L2 proficiency. Furthermore, to measure lexical and collocational complexity, Paquot (2018) analysed 98 articles written by French learners of linguistics. Contrary to expectations, Paquot found that lexical and phraseological complexity measures did not correlate with proficiency level. However, collocation correctness was found to be indicative of proficiency level. These findings highlight the multifaceted nature of collocational knowledge and its role in L2 proficiency assessment. While collocational learning may progress at different rates for learners, the accuracy of collocational usage appears to be a reliable indicator of proficiency level.

Given the diverse and sometimes conflicting results, summarising the plethora of previous findings and the current study proves daunting. Despite this complexity, there is a widespread consensus that knowledge of L2 collocations exhibits a positive correlation with the proficiency level in the L2 domain (Sonbul et al., 2023; Vu & Peters, 2022b). Some researchers propose using collocation knowledge as a viable measure of proficiency, emphasising its potential as an indicator of language mastery (Koosha & Jafarpour, 2006; Paquot, 2018). However, the relationship between L2 proficiency and collocational knowledge is multifaceted. While improved L2 proficiency is generally associated with enhanced collocational knowledge, this connection is sophisticated. The evidence suggests that the correlation between these two facets is complex, and improvements in overall proficiency only sometimes translate to improvements in collocational mastery.

Nevertheless, a fundamental understanding of collocations is crucial for achieving linguistic mastery.

Future studies should consider various variables to understand this correlation. Factors such as different proficiency levels, prior vocabulary knowledge, the frequency of collocational items, levels of L2 exposure, and the role of congruency merit careful examination. Investigating these variables can contribute to a more nuanced comprehension of the relationship between L2 proficiency and collocational knowledge, paving the way for targeted and effective language learning strategies.

5.3.2 Frequency Effect

The ideal way to choose words to teach or learn depends on the learning objective. The selection of words for teaching or learning should be tied to the specific learning objectives in question. The ideal approach considers the context, the desired proficiency level, and the learning experience's overall goals. Whether building a foundational vocabulary, honing communication skills, or mastering domain-specific terminology, tailoring the word selection to align with the learning objectives ensures a more targeted and effective language acquisition journey. However, research has shown frequency to be a very effective tool for these general applications (Vilkaitė-Lozdienė & Schmitt, 2020). Therefore, outlining the past-present history of frequency is widely acknowledged for vocabulary research. In light of this, the history of vocabulary lists based on frequency goes back to 1953 for language teaching (e.g., West, 1953). While several single-word vocabulary lists have been created, few collocation lists exist (e.g., Rogers, 2017a; Rogers et al., 2021). Frequency lists, such as Nation's (2012) list, have frequently been used as the foundation for test design since language learners are likelier to know the frequent vocabulary (Miralpeix, 2020).

The landscape of language acquisition has been extensively explored through numerous studies delving into the frequency effect. Within this domain, research branches into two distinct subclasses. Firstly, the lexical coverage and vocabulary size studies aim to decipher the requisite number of words in an L2 learner's repertoire for successful English comprehension (see, for instance, Adolphs & Schmitt, 2003). This avenue probes the

quantitative aspect of language acquisition, shedding light on the scope of vocabulary needed for proficiency. A parallel avenue investigates the nuanced interplay between word frequency levels and the language competency of L2 learners, tailored to different communicative purposes (as evidenced by works such as Vilkaitė-Lozdienė & Schmitt, 2020; Webb, 2020a). Here, the focus shifts to the qualitative dimension, discerning which frequency levels most indicate proficiency in diverse linguistic contexts.

Notably, these studies predominantly centre on single words, yet their findings may be vital to unravelling collocational mysteries. While the emphasis lies on individual lexical units, the implications for collocations remain an intriguing avenue for exploration. Understanding how single words contribute to the broader canvas of collocation can offer a more holistic comprehension of language acquisition dynamics. In the ever-evolving landscape of linguistic research, synthesising these strands enriches our comprehension of the frequency effect and beckons further exploration into the tapestry of language acquisition.

Evidence shows that individual word knowledge develops based on frequency level (Schmitt et al., 2001) due to the higher likelihood of encountering and being taught more frequent items, so learners acquire them first (Schmitt, 2010). In a similar link, collocations may be learned based on the frequency of its component words and the frequency of the collocation (Nguyen & Webb, 2017; Sonbul et al., 2022); hence, more frequent items process faster than less frequent items (Öksüz et al., 2021). For instance, Sonbul et al. (2022) assessed the productive collocation knowledge of 55 Arabic-speaking English learners and 27 English speakers via three frequency bands (1000, 2000, 3000) of the COCA frequency list. They found a gradual decline in inappropriate response as the frequency band decreased for both groups. Sonbul and her colleagues' (2022) findings proved that L1 and L2 were sensitive to frequency when comparing English speakers versus L2 learners.

However, some researchers demonstrated that the frequency effect was moderate or not a significant predictor in learning collocation (Durrant, 2014b; González Fernández &

Schmitt, 2015; Vu & Peters, 2021). While Vu and Peters (2021) illustrated that corpus frequency was not a significant predictor of learning collocations, Durrant (2014b) found moderate correlations between frequency and collocation knowledge. Due to mixed findings, more research is required to examine the effect of frequency. A few studies have probed collocational knowledge or looked at limited factors in the Iranian context, such as the role of proficiency in collocational learning (e.g., Keshavarz & Salimi, 2007) and the role of congruency (Davoudi & Behshad, 2015). However, there is a lack of research investigating the role of frequency over the different frequency levels of collocations.

Additionally, it is worth mentioning that most previous studies investigating L2 collocation knowledge have utilised the BNC or COCA list to select test items and limit the 1000, 2000, and 3000-word frequency levels (e.g., Fang & Zhang, 2021; Sonbul & El-Dakhs, 2020). The present study's originality is that the test items were taken from 11,212 MWUs of COCA through LCM, or lemmatised concgramming method, a modern method for MWU identification. Consequently, the various levels of frequency were considered in the present research.

Therefore, RQ4 (*To what extent does Persian-speaking L2 English learners' productive collocation knowledge change over MWU frequency levels?*) concerns how much Persian-speaking learners' productive knowledge of collocation changes over MWU frequency levels. It is important to note that the frequency in Rogers's (2017a) list and the current study refer to the co-occurring lemma of pivot words and collocate words as a word combination via lemmatised concgram. The participants' mean scores decreased across the frequency level from 5.90 in the most frequent group (F1) to a mean score of 4.57 in the lowest frequency level (F4). This finding determined whether participants did better on the higher frequency items than the lower frequency items and could be supportive of the usage-based theory (Bybee, 2006). This perspective supports usage-based approaches (e.g., Christiansen & Chater, 2016) since cognitive linguistics focuses on input, frequency, and experience as determinants of language acquisition.

In recent psycholinguistic research, the proponents of usage-based theory argue against attributing a processing advantage to MWUs as holistic units, contending that they can be recorded without presuming that they are held together as a whole only by activating the whole with a more significant increase in usage (e.g., Arnon & Snider, 2010; Siyanova-Chanturia, 2015). According to this theory, the human brain is sensitive to the frequency of exposure, and repeated exposure causes its patterns to become fixed. Since collocations are more infrequent than individual words and the number of collocations is insufficient in EFL materials, the lower frequency of collocations is much more challenging to learn. For instance, Rogers and his colleagues (2021) found that the word *direct* was encountered 18,200 in COCA. In comparison, collocations with *direct* as pivot words occurred only 100 times. Therefore, teaching collocations of high-frequency words is recommended as a priority for teachers.

This finding also aligns with Nguyen and Webb (2017), who used Nation's (2012) BNC/COCA lists to assess Vietnamese EFL learners' knowledge of adjective + noun and verb+ noun collocation at 1,000-, 2,000- and 3,000-word families. They found that collocational knowledge declined over these frequency levels. Since the participants knew less than half of each form of collocation, they concluded that there was no mastery of collocational knowledge at any word frequency level among them. Although, on average, the Iranian participants in this study knew 60% of each form of collocation, it may be because their proficiency levels (CEFR B2 to C1) were higher than those of the Vietnamese participants (CEFR A2 to B1). This evidence could be another supportive finding, suggesting a positive relationship between proficiency levels and knowledge of MWUs.

Nevertheless, single words have received more attention than collocations research in the Iranian context. Few studies have examined the relationship between Persian-speaking learners' knowledge of single-word items and English language skills across word frequency levels (e.g., Derakhshan & Janebi Enayat, 2020). Derakhshan and Janebi Enayat assessed 46 Iranian EFL learners using Vocabulary Level Tests at 2,000, 3,000, 5,000, and 10,000 word-frequency levels and an IELTS speaking test. The 3,000 word-frequency bands

were discovered to contribute significantly to speaking ability. They concluded that IELTS candidates should pay more attention to this band. Furthermore, it has been proposed that as language proficiency grows, word frequency may be replaced by collocation frequency (Wolter & Yamashita, 2018). Accordingly, the most frequently occurring MWUs, such as single words, must be considered. In contrast, less frequently occurring MWUs are less likely to be acquired, which may increase IELTS scores for the participants whose goal is to gain high scores.

Moreover, the current study identified which groups of MWUs were significant predictors of IELTS scores, with the four groups of MWUs as the independent variables and IELTS scores as the dependent variable by answering RQ5a (*How much variance in participants' IELTS scores is explained by the frequency of MWUs?*). The statistical significance of the overall model (i.e., the model with all the independent variables, F1, F2, F3, F4) indicated that the independent variables collectively (i.e., four frequency groups of MWUs taken as one) significantly predicted the dependent variable (i.e., IELTS scores). In other words, when we take those predictors together as a group, they significantly predict the IELTS scores. The regression coefficients, reported in Table 20, indicated that out of the four groups of MWUs, only three (i.e., F1, F3, F4) added significantly to the prediction. However, F2 is not. F2 exhibited a negative correlation (-.011). However, its contribution to the model was not statistically significant ($p = .725$). The Unstandardised Coefficient in column B indicated that F4 was the strongest predictor, with F3 and F1 coming next. A change of 1 score in F4 is associated with a change of .193 score in the IELTS score, but these values for F3 and F1 are .183 and .178, respectively.

Also, the participants' knowledge of MWUs in F4 as the lowest frequency level was lower than the other three frequency levels, and the participants had similar knowledge of MWUs from F2 and F3 frequency levels. However, as indicated by IELTS scores, the best predictor of the proficiency level was the F4 or the lowest frequent items. It could be interpreted that the participants required to obtain higher IELTS scores need to enhance

high-frequency items and move to low-frequency items and use them. On the other hand, the interaction between frequency levels and proficiency was not significant.

These results align with Sonbul et al.'s (2022) findings. Sonbul and her colleagues assessed 55 Arabic-speaking learners with 27 L1 English speakers via controlled productive collocation and productive word tests by electing test items from 1000, 2000, and 3000 frequency bands. They provided the gap-filling test with open-ended responses. Regarding frequency level, their model demonstrated that more suitable replies were given at the 1000 level compared to the 3000 level. However, there was no statistically significant difference between the 1000 and 2000 levels. Also, they found no interaction between frequency level and productive word test scores. They concluded that the collocation frequency study indicates a tight association between vocabulary and productive collocation knowledge, with language users who know more terms constructively being more likely to create higher frequency collocations.

On the other hand, the lack of significance of F2 as a predictor of proficiency raises interesting questions about the nature of language acquisition and the factors that contribute to proficiency. It may suggest that the influence of MWU knowledge on proficiency is not uniform across all frequency levels. While F4, representing the least frequent MWUs, emerged as a strong predictor, F2 did not demonstrate a similar predictive power. This could be due to several factors, such as the specific characteristics of the MWUs included in F2, the distribution of MWU knowledge among learners, or the contextual factors influencing language use and proficiency assessment. Further investigation into the distinct contributions of different frequency levels to proficiency development could shed light on these nuances.

Overall, the participants in this study exhibited a higher level of proficiency with higher-frequency items compared to their performance on lower-frequency ones. This finding underscored the significance of considering word frequency levels in creating L2 resources, advocating for a sorting criterion based on this parameter. Numerous studies, including works by Peters (2014) and Teng (2018), support this claim, emphasising the pivotal role of

word frequency in language education. Furthermore, the results confirm that achieving a high score in assessment tests such as IELTS requires acquiring and using low-frequency items and mastering higher-frequency items. While lower-frequency items may be crucial for obtaining a high score, comprehensive language proficiency involves mastering a range of vocabulary, including the more commonly used words. In light of these findings, the current study provides valuable support for an instructional approach prioritising teaching frequent items. This emphasis aligns to equip learners with a well-rounded vocabulary encompassing common and less common words, ensuring a more comprehensive and practical language learning experience.

5.3.3 Congruency Effect

While no studies have yet been gathered to directly compare the influence of L1 on collocations with its impact on other aspects of language acquisition, existing research indicates that L1 exerts a notable effect on learning L2 collocations (Men, 2018). Studies delving into the role of L1 in L2 collocation acquisition commonly fall into two distinct categories. One line of research scrutinises the footprint of L1 influence by analysing errors made in acquiring L2 collocations. This approach involves examining learners' patterns and types of mistakes when grappling with collocations in their L2. Conversely, another avenue of research investigates the potential impact of L1 in terms of L1 - L2 congruency. This strand of research seeks to understand how congruency or incongruency between the first and second languages affects the acquisition and mastery of collocations. By exploring these two dimensions (L1 influence and L1 - L2 congruency), researchers aim to understand the interplay between the first language and the acquisition of collocations in a second language.

Generally, the earlier collocation research focused on L2 learners' error analysis in this field (Bahns, 1993; Biskup, 1992; Farghal & Obeidat, 1995; Nesselhauf, 2003) and discovered the main reason for such errors related to L1 interference. For instance, in Nesselhauf's (2003) investigations, the trace of L1 influence was observed in nearly half of the L2 collocation errors. The exciting findings of the impact of L1 interference were shown

in Biskup's (1992) study. The researcher assessed Polish and German learners. She found that Polish learners made errors due to their L1, unlike German learners, who frequently made mistakes due to an assumption of formal resemblances, such as writing *to crack* instead of *crunch* in the phrase *to crunch nuts*.

While previous research attempted to find and explain the role of L1 interference inclusively, the possible impact of L1 lexical combinations from the standpoint of the term congruency on learning L2 collocations emerges as a new approach used in collocations research to describe the function of L1 in L2 collocation acquisition. Concerning learners' L1, collocations in an L2 are either congruent with direct translation counterparts or non-congruent with no such equivalents. Several studies illustrated that the overreliance on word-for-word translation from L1 leads to unconventional and perhaps unacceptable L2 collocations even among advanced L2 learners (e.g., Davoudi & Behshad, 2015; Laufer & Waldman, 2011).

The collocation research based on the effect of congruency provides some agreement about this concept. Research shows that L1 - L2 congruency affects the learning and processing of L2 collocations. Collocations are processed more quickly and precisely when dealing with congruent elements than incongruent ones. (e.g., Yamashita & Jiang, 2010). Even advanced L2 learners make unacceptable L2 collocations due to relying too heavily on word-for-word translations from their L1 (e.g., Davoudi & Behshad, 2015). For example, Davoudi and Behshad noted that some errors made by Iranian university students were due to their L1 interference, such as *look for money* (earn money), *learn knowledge* (gain knowledge), and *bring some reasons* (state some reasons).

Within the vast landscape of SLA literature, the role of L1 - L2 congruency emerges as a pivotal factor shaping the processing and acquisition of L2 collocations. Research in this field collectively underscores the substantial impact of congruency on collocational learning in L2 (e.g., Boone et al., 2022; Ding & Reynolds, 2019; Fang & Zhang, 2021; Wolter & Yamashita, 2018). However, finding a generalisation becomes more complex when we consider the interplay of congruency with many other influential factors. Wolter and

Gyllstad's (2013) empirical investigations and the corroborative findings by Ding and Reynolds (2019) illuminate a nuanced relationship between L1 - L2 congruency and proficiency level. This dynamic connection unveils layers of complexity and how congruency operates differently across varying levels of language proficiency. However, the enlightening twist in Ding and Reynolds (2019) reveals that this relationship does not adhere to a linear trajectory. The nonlinear nature introduces a surprising dimension and prompts researchers to explore the complex pathways through which congruency is intertwined with proficiency development.

Moreover, the divergence between enhancing L2 proficiency and cultivating L2 collocational knowledge adds another layer to the narrative. While proficiency growth is a laudable goal, Ding and Reynolds (2019) aptly caution that it only sometimes translates into an equivalent enhancement of collocational competence. This disjunction could lead to the conclusion of the multifaceted nature of language learning. Therefore, exploring L1 - L2 congruency takes on a multidimensional character, weaving its threads with proficiency levels and intersecting with other influential factors. Understanding these relationships deepens our understanding of language acquisition and points to further exploring the diverse pathways that learners traverse to master collocational competence.

In the context of this research, the primary objective revolved around creating a novel resource. A crucial facet of this endeavour involves assessing influential learning factors to discern and prioritise valuable elements. Consequently, this study embarks on a journey to explore the potential impact of L1 - L2 congruency on the comprehension and mastery of MWUs. The investigation into the effect of congruency unfolded through developing a comprehensive MWUs knowledge test comprising 16 congruent and 16 incongruent items. It is imperative to note that a thorough consideration of L1 - L2 congruency underpinned the selection of these items. Each item underwent a rigorous rating process, and those garnering a score above six points earned a coveted spot in the congruent classification. On the other hand, items amassing six points or below were categorised as incongruent. This meticulous classification served as a strategic mechanism to navigate the nuanced

landscape of MWUs and their congruency with the native language, ensuring a comprehensive and finely tuned approach to the subsequent analyses.

In essence, the study not only contributed to the creation of a valuable resource but also undertook a systematic exploration of the role played by L1 - L2 congruency in shaping the knowledge and understanding of MWUs. The research aimed to understand the dynamics between congruency and MWU comprehension by adopting a methodological approach that involved a purposefully crafted test. Through this endeavour, it sought to offer insights beyond the mere creation of a resource, delving into the factors that influence the acquisition of language elements, thus contributing to the broader understanding of language learning processes.

The results revealed that the participants' mean scores for congruent items ($M=11.27$) were higher than incongruent items ($M=9.48$) and supported H_{a1} , which considers Persian-speaking learners obtain congruent collocations scores better than incongruent ones. This finding supports previous research in different contexts, such as Dutch (Peters, 2016), German (Nesselhauf, 2003), Japanese (Yamashita & Jiang, 2010), Chinese (Fang & Zhang, 2021), and Swedish (Volter & Gyllstad, 2011), and Vietnamese English learners (Vu & Peters, 2021) that illustrated that the participants were better on congruent items.

In a study conducted by Vu and Peters (2021), the focus on Vietnamese learners highlighted a compelling connection between congruency and the retention of collocations during reading. Their explicit mention of the enhanced recall of congruent collocations compared to incongruent ones suggests a strong predictive influence of congruency intertwined with prior vocabulary knowledge. This underscores the nuanced interplay between learners' native language congruency, existing vocabulary, and the effective retention of collocations.

Similarly, the exploration into the impact of congruency on Swedish learners of English, as undertaken by Volter and Gyllstad (2011), further enriches our understanding. Through the lens of a lexical decision task and a receptive collocation test, their study

revealed noteworthy patterns in the processing of L2 collocations. Congruent collocations, marked by a seamless alignment between L1 - L2 congruency, demonstrated faster reaction times and higher scores than their incongruent counterparts. This empirical evidence paints a vivid picture of how congruency influences the cognitive processing of collocations, illustrating its role in shaping both the speed and accuracy of language learners in assimilating these lexical nuances. Together, these studies unpack the impact of congruency on collocational processing across distinct linguistic and cultural landscapes. The findings underscore the universality of the congruency phenomenon, transcending specific language pairs, and provide valuable insights into the cognitive mechanisms during the learning journey.

Regarding RQ5b (*How much variance in participants' IELTS scores is explained by congruent and non-congruent MWUs?*), a statistically significant interaction was observed between congruent, non-congruent, and proficiency levels as measured by IELTS scores in the present study. These results demonstrated that IELTS scores improve as the knowledge of non-congruent items increases. Therefore, the findings indicate a positive relationship between proficiency level and expertise in incongruent items, and learners will likely be more successful in acquiring incongruent collocations as their proficiency level increases. This finding is consistent with previous research (e.g., Boone et al., 2022; Sonbul et al., 2023). While most research explored the congruency effect on learning collocation, few studies, such as Sonbul and her colleagues (2023), demonstrated a significant effect of congruency for Arabic-English translator trainees. In her research, 92 participants translated 40 collocations into Arabic-English and English-Arabic. In both translations into and translations from their native language, trainees did not produce natural collocations more often, and the natural translation rate was higher for congruent and transparent collocations. In addition, higher estimates of L2 proficiency tended to correlate with producing natural collocations. This type of study could support evidence to highlight incongruent items in instruction.

The significance of L1 - L2 congruency in shaping the dynamics of collocational knowledge became even more pronounced when Boone et al. (2022) conducted a

longitudinal. Unlike the traditional focus on English, their research breaks new ground by exploring the role of congruency in developing productive collocation knowledge between Dutch-speaking individuals (L1) and German (L2) learners over three years, with assessments conducted at three intervals. The longitudinal lens applied by Boone et al. (2022) allows for a nuanced understanding of how congruency unfolds over time in the learning trajectory. The discerning findings reveal a notable trend in the learners' evolving collocational knowledge. Participants demonstrated an enhanced understanding of congruence across the three assessment points compared to incongruent collocations. This longitudinal pattern suggests a cumulative effect, emphasising the enduring impact of L1 - L2 congruency on the learners' ability to process and utilise collocations effectively.

Furthermore, the observation that knowledge of incongruent collocations increased after one year while knowledge of congruent collocations remained consistent unveils a dynamic interplay within congruency. This asymmetry hints at the nuanced nature of the learning process, where incongruent collocations may require more time and exposure to assimilate fully. In contrast, congruent ones demonstrate a more stable retention. This underscores the importance of considering the temporal dimension when addressing the role of congruency in collocational learning. In essence, Boone et al.'s (2022) longitudinal exploration provides compelling evidence that L1 - L2 congruency is a crucial factor in collocational processing and manifests its influence over an extended period. These insights carry implications for instructional practices, suggesting that educators should be attuned to the persistent impact of congruency in guiding learners toward a more nuanced and compelling command of collocations.

Given insights from the literature, it is apparent that errors made by advanced students often stem from first-language interference (Davoudi & Behshad, 2015; Laufer & Waldman, 2011; Phoocharoensil, 2011; Şen, 2019). Considering this, the learning process is perceived to be more manageable when dealing with congruent collocations compared to non-congruent ones (Gyllstad & Wolter, 2016; Wolter & Gyllstad, 2011, 2013; Yamashita & Jiang, 2010). The literature consistently indicates that learners make more errors when

grappling with incongruent collocations (Davoudi & Behshad, 2015; Yamashita & Jiang, 2010). For instance, 47% of errors among Turkish learners (Şen, 2019), 47.4% of errors due to L1 and 37% of mistakes due to synonyms strategy occurred by Persian-speaking learners. Consequently, the role of congruency in the acquisition of collocations emerges as a crucial aspect worthy of careful consideration in language education. Understanding how congruency influences the learning process can inform targeted instructional strategies and help address challenges related to L1 interference among advanced learners.

Hence, there appears to be a significant impact on learning from a lack of congruence between L1 and L2 when *take a photo* refers to an appropriate collocation in English and a literal translation into Persian (/ʔāks bɒgi:r/ عكس بگیر). In contrast, *mach ein foto* refers to *make a photo* in German. On the other hand, *take* in *take medicine* in English is equal to *drink* in Japanese and *use* in Persian. As these examples demonstrate, languages are not entirely congruent. For word-for-word translation, errors will likely be higher in most languages due to cross-linguistic relationships. Therefore, learners make more errors if combinations are incongruent based on L1 interference.

Despite the strong agreement among researchers to acknowledge the role of congruency, only some studies considered using this criterion to create English collocation resources (Rogers, 2017a). Therefore, this finding comes in line with previous studies that recommend that besides improving L2 proficiency, emphasising challenging items such as incongruent and explicitly instructing collocations in the classroom (Boone et al., 2022; Nesselhauf, 2003; Sonbul et al., 2023). Moreover, in line with RQ1, the findings of this study indicate that many collocations are incongruent to some degree, and the focus on L1 - L2 congruency would be appropriate (see Barghamadi et al., 2023).

This exploration extends to the pedagogical implications derived from a comprehensive review of recent studies, encompassing error analysis and studies delving into congruency. What emerges from this collective body of research is a consensus on the pivotal role of L1 interference in shaping the production of L2 collocations.

Within this framework, scholars such as Bahns (1993) advocate for a nuanced instructional approach, making a compelling case for focusing on teaching collocations incongruent with learners' L1. This tailored strategy aligns with acknowledging the impact of L1 interference on collocation learning and aims to mitigate potential challenges by strategically addressing incongruent items.

It is worth noting that recent congruency studies, while not explicitly exclusive to incongruent items, underline the importance of enhancing learners' attention to contrastive analysis (Boone & Eyckmans, 2023; Laufer & Girsai, 2008). This nuanced perspective suggests that while incongruent collocations may be a focal point, the broader emphasis lies in cultivating learners' awareness and analytical skills through a contrastive lens. In essence, the pedagogical implications derived from these studies advocate for a balanced approach strategically incorporating incongruent collocations into instructional materials and fostering learners' ability to engage in contrastive analysis. This dual-pronged strategy can potentially enhance collocational proficiency by addressing L1 interference and promoting a deeper understanding of the contrasts between the first and second languages.

Building on the present study's findings, it is strongly recommended that L1 - L2 congruency be integrated as a pivotal criterion in developing English language learning materials for L2 learners. This research does not advocate for the exclusive focus on incongruent items in teaching; instead, it underscores the significance of considering congruency as a guiding principle. While acknowledging the importance of a comprehensive approach, this research highlights the practicality of creating a curated list pinpointing items that warrant additional study time. This view is particularly beneficial because incongruent items, as revealed in the study, impose a higher learning burden on learners. By tailoring instructional materials to incorporate a strategic emphasis on L1 - L2 congruency, educators can enhance the learning experience and streamline the acquisition of MWUs for Persian-speaking learners of English.

In alignment with these recommendations, the study's L1 - L2 congruency rating results have been instrumental in developing a digital format for MWU resources explicitly

tailored for Persian-speaking learners. This adaptive and targeted approach seeks to optimise the learning process, considering the linguistic nuances and challenges of incongruencies between the first and second languages.

5.3.4 Semantic Transparency Effect

The final variable examined in the present study was semantic transparency. The semantic transparency of MWUs, or how literal or idiomatic MWUs are, assists in identifying collocations that need additional study. Generally, researchers distinguished collocations from free combinations or idioms by following the phraseological approach (Howarth, 1996; Men, 2018). It has been argued that collocation within this approach is characterised by semantic transparency. It is defined as "the whole combination can be deduced from the meaning of the individual elements"(Men, 2018, p. 21). From this perspective, a word combination, such as *make a decision*, is a collocation, but *kick the bucket* is an idiom.

In another view, to define collocations based on frequency approach, collocations can be conceptualised as two-word pairs that co-occurrence in the language exceeds the chance level, regardless of the degree of transparency ("*clear message*") or opacity ("*heavy traffic*") (Sonbul et al., 2023, p. 3). As mentioned in the literature review, the frequency of co-occurrence and lemmatised concgram are combined to define collocations or MWUs as a single entity in the current research. Based on this view, MWUs are collocations and put on the continuum from transparency to non-transparency.

Regardless of the various definitions of collocations based on transparency, a few researchers pointed out that semantic transparency can affect collocational learning, although their research designs and targets differed (Gyllstad & Wolter, 2016; Sonbul et al., 2023; Yamashita, 2018). Among participants in Gyllstad and Wolter's (2016) study, frequency and transparency were essential factors in judging word combinations, with shorter reaction times for combinations that appeared transparent. A significant effect was observed with congruency and semantic transparency among Arabic-speaking translator trainers in Sonbul et al.'s (2023) study. In that study, collocations with a congruent meaning and collocations with a transparent meaning were more likely to be rendered naturally in

translation tasks. Additionally, some researchers classified word combinations via different taxonomies to categorise items based on transparency (Macis & Schmitt, 2017b; Yamashita, 2018).

Consequently, there are two categories of semantic transparency research. One is to investigate the function of semantic transparency in collocation learning. Another organises various elements according to several taxonomies. As a result, combining two types of investigations into one research is uncommon. In the first section of the current study, most items were classified as literal items. In the second section, this study aimed to examine the effect of transparency on the knowledge of MWUs. The results revealed that the participants' mean score for literal items ($M=69\%$) was higher than for opaque ones ($M=58\%$) and supported the second alternative hypothesis (H_{a2}) that Persian-speaking learners obtain better scores on transparency items than opaque ones. Specifically, the findings demonstrate that the participants exhibited a higher level of proficiency in comprehending MWUs that are semantically transparent than those considered opaque. This discrepancy may suggest the potential challenges in deciphering the meaning of MWUs that are not semantically transparent. Further research is warranted to explore the factors that may contribute to the differences in the comprehension of MWUs with varying degrees of semantic transparency.

This finding partially aligns with previous results indicating that opaque collocations are difficult for learners (Gyllstad & Wolter, 2016; Sonbul et al., 2023). In the semantic judgment task, Gyllstad and Wolter (2016) examined Swedish-speaking learners of English and native English-speaking to control the process of free combinations as literal items versus collocations as opaque items. Their findings demonstrated that collocations required extended reaction time, and more errors occurred with collocations, suggesting semantic transparency plays a role in collocation processing. Arabic–English translator trainees translated short passages of 40 collocations in Sonbul et al.'s (2023) study. They noted that their study was a follow-up study for their previous studies to examine the effect of transparency (Sonbul & El-Dakhs, 2020; Sonbul et al., 2022). The researchers found that it

was more likely that collocations with a transparent meaning and congruency with Arabic would be presented naturally.

It is possible that semantic transparency can interact with the congruency effect. As an additional finding, the results of this section illustrated a strong correlation between semantically transparent and congruent items ($r = .89$). Earlier studies in L2 collocations support this finding (Yamashita, 2018). In this regard, Yamashita (2018) categorised 240 collocations employed in previous investigations into congruent and incongruent. Observing the results confirms that transparent items dominate the congruent category and opaque items dominate the incongruent category.

Considering RQ5c (*how much variance in participants' IELTS scores is explained by semantic and opaque MWUs?*), examination of the regression coefficients revealed that both semantic MWUs ($B = .020$, BCa 95%CI [.015,0.26]) and opaque MWUs ($B = .026$, BCa 95%CI [0.20, .031]) significantly contributed to the prediction of the model, as evidenced by their respective p -values ($p < .001$). Interestingly, while semantic and opaque MWUs emerged as significant predictors of IELTS scores, opaque MWUs exhibited a more substantial unique effect, with a β weight of .467. This suggests that opaque MWUs play a particularly influential role in predicting language proficiency as measured by IELTS scores, highlighting the importance of considering both semantic and opaque MWUs in language assessment and instruction. However, no interaction effects were observed. There seems to be a qualitative difference between L2 proficiency and collocation use, such that more proficient learners are more likely to cope with more opaque items. This result partially aligns with X. Du et al.'s (2022) findings. The authors examined collocations in 3,600 compositions extracted from a large corpus of manuscripts by L2 learners with different L1 backgrounds and proficiency levels. They found that collocations consisting of semantically complex are more likely to be used with increased L2 proficiency. X. Du et al.'s results matched the findings in the Iranian context by Estaji and Hashemi (2022).

Estaji and Hashemi's utilisation of Moon's (1998) taxonomies to categorise phraseological units unveils a fascinating exploration into the landscape of language usage,

explicitly focusing on anomalous collocations, formulae, and metaphors. Moon's nuanced classification system, which delineates formulae into saying, proverbs, and similes, provides a structured framework for dissecting the varied linguistic elements at play. In their study, Estaji and Hashemi observed a consistent trend among participants, irrespective of their band scores. It is noteworthy that all participants included uncomplicated formulas in their written expressions. Specifically, *on the other hand*, it was recorded 329 times in their articles. This finding highlights the entrenched nature of this familiar formula in written discourse.

However, the analysis takes a turn when delving into the sub-classifications within Moon's taxonomy. While Moon identifies saying, proverbs, and similes as distinct types of formulae, Estaji and Hashemi's findings reveal an interesting pattern. The participants predominantly utilised expressions falling into the categories of saying and proverbs, as evidenced by their findings of only one occurrence for each sub-classification. Interestingly, the absence of similes in the participants' essays raises questions about the selective nature of formulaic language use, prompting further exploration into the factors influencing the preference for certain formulaic expressions over others.

In comparison, 32 transparent metaphors (i.e., *in touch with*), four semi-transparent metaphors (i.e., *lose track of time*), and 11 opaque metaphors (i.e., *silver lining*) were used by higher band scores candidates as complicated phraseological units. This gradient of metaphorical complexity suggests a deployment of figurative language, reflecting a higher level of linguistic proficiency among candidates with elevated band scores. Estaji and Hashemi's application of Moon's taxonomies offers a structured lens to examine phraseological units and reveal language users' preferences and patterns. The subtle interplay between band scores, formulaic expressions, and the selective adoption of specific sub-classifications within Moon's taxonomy contributes to our understanding of how Iranian students navigate and deploy formulaic language in written contexts. Moreover, Estaji and Hashemi's interview data showed that candidates with high band scores had a more robust

understanding of phraseology. These findings were consistent with the present study, which found that opaque MWUs had an even more substantial impact on IELTS scores.

In the current study, the degree of transparency, while considered, emerges as a relatively minor factor in determining MWU knowledge. A notable illustration is the diverse responses to two opaque items: '*pouring in*' received answers from 46.7% of participants, while '*drift off*' garnered responses from 22.1%. Despite both items falling under the opaque category, their varying response rates underscore the complex nature of collocational learning, where factors beyond transparency come into play.

Delving deeper into L1 - L2 congruency ratings provides valuable insights into the nuances of these responses. Notably, *pouring in*, classified as more frequent (F2) in the L1 - L2 congruency ratings, received a substantial 6 points, while *drift off*, categorised as less frequent (F3), garnered 0 points. These observations highlight that the frequency and congruency ranking contribute significantly to the participant's ability to answer these opaque items correctly. This result underscores the multifaceted nature of collocational learning, where the interplay of frequency and congruency, rather than transparency alone, plays a pivotal role in learners' proficiency.

An intriguing pattern emerges among Persian-speaking learners when comparing opaque and transparent items. When items were classified in higher ranks based on congruency and frequency, these learners displayed a higher accuracy rate in answering items correctly. This view suggests that a deeper understanding of L1 - L2 congruency and the frequency of collocations contributes to improved performance, transcending the distinction between opaque and transparent items. These findings illuminate the complex dynamics of MWU knowledge acquisition, emphasising the need to consider a spectrum of factors beyond transparency. The interplay between frequency, congruency, and learners' responses underscores the rich complexity of collocational learning, contributing to a more nuanced understanding of how linguistic elements are assimilated and utilised in the context of language acquisition.

A quick refresher on the present study highlights the crucial role of semantic transparency in the examined collocations. Notably, a relatively small percentage, comprising 1,518 items or 14.1% of the sample, exhibited opaque meanings. Within this category, a more specific subset of 161 items were not only opaque but also congruent with Persian expressions, exemplified by phrases like *My heart stopped*. Despite this congruency, Persian-speaking learners achieved lower scores on opaque items, with a strong correlation observed between their performance and IELTS scores. Interestingly, no significant interaction was found between the transparency nature of MWUs and learner performance.

This examination prompts a noteworthy recommendation from the study: When creating MWU resources, congruency emerges as a salient criterion compared to transparency. While semantic transparency undoubtedly plays a role in understanding collocations, the congruency between L2 and L1 influences learner proficiency significantly. The findings underscore the nuanced interplay between transparency, congruency, and learner performance, emphasising that focusing on congruency is paramount in developing MWU resources. This insight carries implications for educators, materials developers, and language practitioners, suggesting that a strategic emphasis on congruency can potentially enhance learners' ability to comprehend and utilise collocations effectively in their second language endeavours.

5.4 Chapter Summary

The chapter provides a comprehensive exploration, offering detailed descriptions of each study question and their responses. A notable observation emerges, indicating a lack of consensus and uniform inclusion criteria for MWUs in teaching materials. Various studies reveal a tendency to exclude certain MWUs, emphasising the selectivity inherent in the teaching process. Recognising that not all items can feasibly be taught adds a layer of complexity to the pedagogical landscape.

Given these circumstances, the principal objective of the research is to establish the precedence between L1 - L2 congruency and semantic transparency in selecting MWUs for explicit teaching and study. This pivotal inquiry deeply probes the essence of effective language education, seeking to understand which criterion of congruency with learners' L1 or the transparency of meaning holds greater significance in language acquisition. The findings reveal that while L1 - L2 congruency and semantic transparency play essential roles, L1 - L2 congruency emerges as a more critical factor in the teaching process. Specifically, incongruent collocations, which deviate from learners' native language patterns, tend to pose more significant challenges and are prone to generating errors. Therefore, prioritising L1 - L2 congruency in selecting MWUs for explicit teaching is essential for effective language instruction. Exploring this central question contributes to the ongoing discourse on language pedagogy and provides practical insights for educators and materials developers. By discerning the key factors that should guide the selection of MWUs for explicit teaching, the research aims to inform and enhance language learning methodologies, ensuring a more targeted and practical approach to including MWUs in instructional materials.

In brief, these findings and evidence from previous studies highlighted that L1 - L2 congruency is a fundamental criterion to consider when selecting MWU items requiring more teaching time. Since they are prone to generate errors for learners, teachers are advised to pay additional attention to incongruent collocations. Furthermore, especially regarding MWUs with non-transparent meanings, the study sample consists of a tiny proportion of opaque items. It follows that asserting that the L1's corresponding compound forms have implications beyond transparency makes sense. Given that literal formulations dominated high-frequency collocations in the present study, it seems unreasonable to only consider non-literal word combinations, even though focusing on meaningfully opaque collocations over transparent ones is essential.

Therefore, this study disagrees with others who argue that non-transparency items are always the most critical factor in selecting MWUs for teaching. Despite this, since many

collocations are literal and L1 - L2 congruency is the most probable cause of L2 errors, this cross-linguistic issue requires extra attention. Therefore, a contrastive L1 - L2 strategy may be advised to make L2 learners aware of the distinctions between L1 and L2. This data may highlight the necessity for resources specifically adapted for particular learner groups instead of the usage of general L2 learning materials created for all learners. As a result, the contrastive analysis might help design multilingual English materials.

The rationale behind assessing learners' knowledge is to improve language learning programs since teachers need to focus on certain MWUs with the various influences in mind that will affect acquisition and their choices for instruction. Therefore, exploring the factors that affect L2 collocation knowledge may provide insight into teaching, learning, and curriculum design. Also, assessing a particular learner group's knowledge of collocations can help determine which items they need to focus on. Accordingly, this research investigated the salient influential factors such as frequency, L1 - L2 congruency, and semantic transparency.

The results of Persian-speaking learners revealed a positive relationship between proficiency level and knowledge of MWUs. This knowledge among the target participants indicated a decrease in learners' collocational knowledge, which was also observed over the four frequency levels of the MWUs list. The results show that to achieve a high IELTS score, participants need to acquire and use the least frequent items, whereas MWUs require using the most frequent ones. Thus, emphasising high-frequency MWUs is crucial for learners to attain proficiency in collocational knowledge and language skills. The study also supports sorting items based on frequency, essential to creating an MWU resource.

Following the previous research, the present study followed two alternative hypotheses regarding congruency and semantic transparency. These perspectives confirmed that the target group obtained higher scores from congruent and transparent items than noncongruent and opaque ones. However, there was no real interaction between semantic transparency and opaque items. The interaction between congruent and incongruent items was significant.

In conclusion, the study findings assert the prominence of L1 - L2 congruency in the teaching process, focusing on semantic transparency. Emphasising the explicit awareness of MWUs through contrastive analysis aids in highlighting both similarities and differences in word combinations. These findings advocate for developing tailored learning materials for L2 learners based on their L1, underscore the significance of considering frequency levels, and reinforce the importance of L1 - L2 congruency in language education.

CHAPTER SIX CONCLUSION

6.1 Introduction

This chapter is the culmination of the entire thesis. It consolidates the discoveries made and explains their direct connections to the established objectives and research questions. In Section 6.2, the findings presented in the previous chapter are thoroughly reviewed, highlighting the implications that each discovery holds for L2 collocational research. The following section examines the theoretical and pedagogical implications of L2 collocation acquisition, offering a comprehensive overview and establishing connections between the findings and pivotal aspects within the field.

Furthermore, the chapter provides a general summary of the invaluable contributions this thesis has made to both theory and practice. It delineates how the research findings not only advance scholarly discourse within the field but also offer actionable insights that can positively influence teaching methodologies or curriculum development. In addition, the data underscores the need for resources tailored to specific learner groups, diverging from the generic L2 learning materials designed for a broad audience. While acknowledging the significance of these contributions, it is essential to explore the limitations encountered during the study, which will be thoroughly discussed in Section 6.5.

This section also paves the way for future research directions, presenting new avenues and acknowledging the challenges that may require further exploration. Some research questions faced complexities that could not be entirely resolved, highlighting the need for additional study in these areas. The last section of this chapter provides a brief overview of the study's objectives, justification, methodology, key findings, and conclusive remarks. This final section encapsulates the essence of the entire thesis, offering readers a comprehensive understanding of the journey undertaken and the valuable insights gleaned from the research endeavour.

6.2 Overview of Findings

There has been a growing scholarly interest in exploring MWUs within SLA research in recent years. This is due to their significant impact on language proficiency. However, despite their importance, there is still a lack of clear definitions and classifications for these linguistic units. Additionally, neglecting MWUs in ELT materials presents significant challenges for researchers, educators, and L2 learners. These issues have become a significant concern for the academic communities. Identifying and providing a list of MWUs would help researchers and educators improve the quality of ELT materials. This, in turn, would benefit L2 learners, as they would be able to develop a better understanding of MWUs and how to use them effectively. Therefore, this study attempted to fill this gap by exploring selection criteria to identify useful MWUs for explicit instruction.

The study found that L1 - L2 congruency was a more critical factor in MWUs' teaching when most MWUs were incongruent with Persian translation based on contrastive analysis. The findings suggest that incongruent collocations, which deviate from learners' native language patterns, pose significant challenges and generate errors. Contrary to popular belief that non-transparency items are always the most critical factor in selecting MWUs for teaching (Shin & Chon, 2019), the study reveals that literal formulations dominate high-frequency collocations in this large-scale study with 11,212 MWUs items. While focusing on meaningfully opaque collocations over transparent ones is crucial, considering non-literal word combinations solely might be unreasonable.

The study's findings indicate that it is crucial for teaching materials to prioritise L1 - L2 congruency and underscore the necessity of making comprehensive collocation resources available. Teachers could find it helpful to explicitly teach incongruent items, while learners with limited study time may benefit from a list of items that require more attention. The study's findings could be helpful for Persian learners aiming to enhance their collocational fluency. Consequently, this study may highlight the necessity for custom-tailored resources specifically adapted for particular learner groups instead of generic L2 learning materials created for all learners.

This research addressed a critical gap in language learning resources for Persian-speaking learners by developing a web-based resource called General English Phrases containing 4,600 high-frequency MWUs. This resource is valuable for learners seeking to enhance their collocational knowledge and language proficiency. The web-based resource provides access to a comprehensive database of high-frequency MWUs, allowing Persian-speaking learners to engage with authentic language materials and reinforce their understanding of common word combinations and expressions. This fills a significant void in available resources explicitly tailored to the needs of Persian learners, empowering them to navigate the complexities of English language usage more effectively.

In addition, the results of assessing Persian-speaking learners revealed a positive relationship between proficiency level and knowledge of MWUs. This relationship underscores the importance of proficiency in acquiring and utilising MWUs effectively. Interestingly, the study observed decreased learners' collocational knowledge across the four frequency levels of the MWUs list, indicating the need for ongoing instruction and reinforcement of high-frequency MWUs. Moreover, the findings suggest that achieving a high score on language proficiency tests like the IELTS requires learners to acquire and utilise both the least frequent and most frequent items of MWUs.

While utilising high-frequency MWUs is crucial for learners to attain proficiency in collocational knowledge and language skills, mastery of these items is essential for overall language competence. Emphasising high-frequency MWUs in language instruction is vital for supporting learners in achieving proficiency in collocational knowledge and language skills. Thus, the study supports sorting items based on frequency, which is essential for creating an MWU resource. By organising MWUs according to their frequency levels, educators can prioritise teaching and learning efforts, ensuring learners focus on mastering the most frequently used expressions in the target language.

6.3 Theoretical and Practical Implications

6.3.1 Definitions and Classifications of MWUs

Since researchers reached the remarkable conclusion that knowledge of collocations/MWUs items is essential for L2 learners, a significant emphasis has been placed on MWUs in SLA research and publications related to English teaching materials. In this light, the evaluation of published books and articles in both vocabulary and MWU research shows that the scholars acknowledge that knowledge of a language involves knowledge of MWU, even with diverse terms and concepts (e.g., FSs, MWIs). For instance, the *Routledge Handbook of Vocabulary Studies* (Webb, 2020c) explains the key aspects and challenges of single words and MWIs in vocabulary research. The book *Understanding Formulaic Language* (Siyanova-Chanturia & Pellicer-Sánchez, 2018) exclusively provides complementary perspectives of formulaic sequences.

In this regard, the pioneers in this field of study, such as Hoey (2005) and Wray (2002), agreed that the core aspect of communication competence is mastery of these items. Likewise, the corpus studies identified that the spoken and written production of English L1 speakers was a total of MWUs. Therefore, MWUs have been increasingly studied in SLA research during the past two decades since knowledge of these items contributes to a high level of communication and is an essential metric of proficiency in L2 acquisition.

Paradoxically, upon closer examination, the evidence suggests that foundational issues in this topic persist despite extensive research efforts. The literature review revealed a consistent theme: producing collocations remains challenging for L2 learners, even at proficient levels (Bahns & Eldaw, 1993; Sonbul et al., 2023). This enduring difficulty implies that researchers interested in exploring L2 collocational knowledge and development resources may encounter significant challenges.

From the theoretical perspective, this study has explored several reasons why learning collocations has become more challenging. First, there is no universal definition for MWUs, which leads to the emergence of various terms and classifications. As such, it is unavoidable that the inconsistent use of terminology might make it challenging for teachers and even scholars to understand the distinctions between the various types of MWUs. Accordingly, the lack of a universal definition and consensus on defining this term causes no

unique method to identify and select valuable items to teach or create efficient English collocation materials. Therefore, they are, not surprisingly, confronted with various terms and concepts from different perspectives.

The literature review showed that many researchers from different perspectives have proposed various classifications to identify and classify different types of MWUs using multiple criteria. Based on these classifications, the main categories are collocations, idioms, and phrasal verbs. Ignoring diverse perspectives, these categories would pose another problem when some definitions overlap, particularly between idioms and collocations. For example, this issue becomes prominent when a phrase such as *kick the bucket* according to transparency is classified as a collocation or pure idiom in Grant and Bauer's (2004) classification but is classified as an idiom in Moon's (1998) classification and definition. If the goal were to select high-frequency collocations, such terms would not have been identified due to classification as idioms. It might be challenging to tell 'collocations' apart from phrasal verbs, idioms, and other word combinations. Afterwards, some researchers also investigated different types of MWUs that were difficult for L2 learners, like idioms (e.g., Grant & Bauer, 2004). As researchers delve into the intricacies of these classifications, it becomes evident that distinguishing between collocations, idioms, and phrasal verbs poses a significant challenge, impacting the identification of high-frequency terms and potentially complicating the learning process for L2 learners.

The evolving justification for concurrently considering various word combinations becomes increasingly evident as this research unfolds. While the primary aim is not to comprehensively define MWUs but to pinpoint and identify high-frequency items, comprehensively understanding and studying these combinations for effective collocational fluency development becomes apparent. The research adopts a dual perspective to explore these terms. First and foremost, the practical objective for educators is to teach high-frequency vocabulary. Therefore, the study emphasises incorporating these high-frequency phrases into the MWUs format. By doing so, educators can provide students with a targeted and practical approach to learning, aligning to enhance collocational fluency. This

perspective acknowledges the real-world applicability of language learning, catering to the immediate needs of students to engage effectively with common and frequently used expressions. The research underscores the synergistic relationship between high-frequency vocabulary and collocational fluency. By approaching teaching from the MWUs format, educators can bridge the gap between theoretical vocabulary knowledge and the practical application of language in various contexts, thereby fostering a more robust and versatile linguistic competence among students.

Also, other types of MWUs were challenging for L2 learners, and their definitions overlap. The simple way to cope with this issue is to put all of them as single entities, and this perspective would be achieved by lemmatised concgramming approach. Therefore, all the MWUs identified are considered the same in this study, regardless of whether they are phrasal verbs or idioms. This perspective defines collocations and MWUs as one entity between transparency and non-transparency. Second, there is an agreement that learning collocations is essential for fluency and should be the main priority in every EFL course. However, the evaluation of L2 collocational resources indicated that EFL textbooks and authentic materials probably need more MWU. Therefore, L2 learners find achieving such fluency challenging since it is rarely emphasised in classroom or EFL materials. This results from the absence of a comprehensive tool that outlines which collocations to teach to aid learners in mastering high-frequency English. So, although many researchers agree upon the relevance of collocational fluency and focus on high-frequency collocations directly, learners, teachers, and material developers need guidance on which to focus.

6.3.2 Challenges in Teaching and Learning MWUs

Despite the importance of MWUs in language proficiency, L2 learners face numerous challenges in acquiring collocations and other MWUs. These challenges include the influence of L1 interference, the difficulty of identifying and selecting high-frequency MWUs for instruction, the lack of explicit instruction on MWUs in language teaching materials, and the need for more effective instructional strategies and materials. Considering the need for more efficient resources, some fundamental issues exist. One of the issues is that most of

the prior research had its reach restricted to a particular type of collocation or MWU. Most resources have prioritised academic word lists rather than developing a comprehensive list appropriate for general English usage, as this study has undertaken.

Another issue raised is that there needs to be an agreement on the identification criteria used to select essential MWUs for L2 learners. It is not surprising that a wide range of resources would be needed, as collocations have been determined and defined in different ways by the use of various analysis methods. In addition, teachers and material developers need to provide more guidance in selecting items that may be particularly noteworthy towards students. Pinpointing collocational challenges allows for targeted and effective language instruction. It enables educators to tailor teaching materials and activities to address students' difficulties, optimising the learning process. Additionally, understanding the learning burden associated with particular collocations aids in prioritising teaching efforts, focusing on the more challenging items for students to master. This approach aligns with the principle of learner-centred education, where the curriculum is adapted to meet the needs and challenges of individual students (Barghamadi, 2020). By addressing collocation errors directly, educators contribute to a more nuanced and personalised language learning experience, fostering a deeper understanding and application of collocations in real-world contexts.

The evidence has shown that identifying selection criteria sheds light on this challenging task. Firstly, there was a degree of incongruence between the English and Persian translations when more than half of the MWUs examined were incongruent. The findings highlighted the impact of L1 - L2 congruency on the learning burden for high-frequency English MWUs. The congruency between L1 and L2 is an issue for any study that relies exclusively on semantic transparency to determine the learning burden (e.g., Boone et al., 2022; Laufer & Girsai, 2008; Nesselhauf, 2005; Peters, 2016; Wolter & Gyllstad, 2011). Also, plenty of previous studies discovered that L1 interference was the primary source of the generation of collocational errors (e.g., Boone et al., 2022; Laufer & Girsai, 2008; Nesselhauf, 2005). While L1 congruence might facilitate the acquisition of MWUs,

incongruence may hinder it (Peters, 2016; Wolter & Gyllstad, 2011). Therefore, the impact of L1 and L2 congruence must be considered when designing studies investigating the acquisition of MWUs. The findings of this study add to the body of knowledge on language acquisition and provide insight into the challenges associated with acquiring MWUs in a second language.

Secondly, some researchers agree that opaque items should be regarded as collocations (Moon, 1997). In another view, instruction should be provided regarding non-transparent or semantically opaque words that frequently occur together (Martinez & Schmitt, 2012; Shin & Chon, 2019). Since most of the items found were semantically transparent, a semantic transparency analysis could have been more successful in helping choose just those semantically opaque items that need extra study time. Contrarily, L1 - L2 congruency was discovered to be a crucial factor to consider, with half of the items detected being incongruent and necessitating additional study. Since many collocations are semantically transparent, it may not be appropriate to focus only on items that are not transparent.

Literary collocations' educational demands are undoubtedly lower than their semantically opaque counterparts (Martinez & Murphy, 2011). It makes sense to divert more attention to the intricacies of semantically opaque collocations, as unravelling their meaning requires a deeper understanding. By prioritising these less transparent collocations, educators can challenge students to explore language nuances and broaden their comprehension skills. It is a strategic move that raises the educational bar and cultivates a richer and more nuanced grasp of language for learners.

However, the results of the present study revealed that the most frequent MWUs were literal formulations. Due to this, it is not valuable to consider semantic transparency alone since it excludes many collocations that would otherwise be worth teaching directly. Furthermore, a low number of items were classified as opaque. Accordingly, studies that only consider nonliteral formulations as collocations or opaque items that deserve more teaching time will ignore a substantial proportion of high-frequency MWUs. Contrary to

Martinez and Schmitt's (2012) claim that non-transparent MWUs are valuable for L2 learners, this research confirms that this approach is unreasonable. Therefore, teachers would benefit from having access to textbooks and other sources that use congruency in selecting essential items for instruction to identify the most challenging MWUs.

In addition to L1 - L2 congruency and semantic transparency, researchers consider various collocation identification criteria, such as meaningful unit, native speaker intuition, colligation, MI, collocation dispersion, and chronological data. However, the present study claims that selecting the combinations that should be the subject of teaching and instruction in collocation research is one of the most challenging components of the process. Examining students' collocation errors is a pivotal step in understanding their collocational challenges and identifying items with learning burdens. By delving into the nature of these errors, educators can gain valuable insights into the specific areas where students may struggle to form accurate and contextually appropriate word combinations.

The study illustrated that various factors, such as frequency, congruency, and semantic transparency, may influence the learning burden of MWUs. The salient role of high-frequency vocabulary is highlighted and deserves the creation of vocabulary resources based on this criterion (e.g., Nation, 2013). The significance of high-frequency vocabulary cannot be overstated, and as such, it is essential to develop vocabulary resources tailored to this criterion. As Nation (2013) suggested, it is imperative that we prioritise the creation of such resources in order to communicate and comprehend high-frequency vocabulary effectively. By doing so, we can improve our overall comprehension and ensure that we are able to convey our intended meaning effectively. Consequently, tailoring instructional materials to meet the needs of specific learner groups is essential for effective language teaching based on contrastive analysis and frequency.

6.3.3 Implications for Language Teaching

Practical strategies and activities are vital in enhancing collocational fluency in language classrooms. In this regard, Martinez (2013) recommended using a Frequency Transparency Framework (FTF) approach to assist teachers in selecting phrases to teach. To implement

this approach, begin with the most frequent and opaque, followed by the most frequent and transparent, and then the least frequent and more transparent phrase. The salient role of high-frequency vocabulary is highlighted and deserves the creation of vocabulary resources based on this criterion (e.g., Nation, 2013). It is imperative to adjust frequency measures to fit learners' needs if the framework is to be practical. For instance, it would be highly unconventional for any English teacher or writer to insist that the phrase "*take the bus*" should be taught late in any language course, even though this MWU does not appear very often in the BNC (Martinez, 2013, p. 192), it is vitally essential for giving directions to their students.

Meanwhile, a valuable and necessary teaching strategy is choosing MWUs with non-compositional meanings if opaque items are the most challenging part of acquiring L2 knowledge. If revised and compared to the previous studies, L2 learners and English speakers (L1) showed the transparency effect (Gyllstad & Wolter, 2016). In contrast, only L2 learners indicated the congruency effect (e.g., Wolter & Gyllstad, 2011, 2013; Yamashita & Jiang, 2010). Consequently, it seems logical to claim that the presence of equivalent compound forms in the L1 has further effects beyond transparency. Considering the present study's findings, literal formulations dominated high-frequency collocations. Even though paying attention to meaningfully opaque collocations over transparent ones is essential, suggesting that focusing exclusively on non-literal word combinations is an unreasonable approach.

Moreover, a great deal of literature demonstrates that L1 interference is the primary source of L2 errors (e.g., Davoudi & Behshad, 2015; Nakata, 2006; Peters, 2016; Zhou, 2016), and L1 - L2 congruency is one of the significant predictors in collocational research (e.g., Sonbul et al., 2022). This cross-linguistic issue requires more attention. As a result, pedagogical consideration is emphasised for items with low L1 - L2 congruency. The items in this study with non-transparent meanings represent a small sampling of the total number of MWUs examined. However, learners need sufficient prior knowledge to understand the items, even if they are transparent. For instance, phrases such as *take medicine*, *take an*

exam and *take a break* were classified as literal items. They are incongruent with their Persian equivalent and might be challenging to understand, while *take* is equal to *eat*, *do* and *have* in Persian translation, respectively. These examples demonstrated that L1 - L2 congruence merits additional focus and is an essential criterion for language pedagogy.

From a pedagogical viewpoint, raising learners' awareness of MWUs as essential components of language and encouraging them to pay attention to MWUs are generally endorsed from a teaching standpoint. The current literature review on learning MWUs indicated the impact of congruency on incidental learning (e.g., Vu & Peters, 2021, 2022a, 2023) and intentional learning (e.g., Peters, 2016), Vu and Peters's (2023) results revealed that congruent collocations were better learned from reading input than incongruent items incidentally. They concluded that by comparing congruent collocations to incongruent collocations, L1 counterparts of the component terms may have aided learners in understanding those collocations in the texts more quickly and acquiring them more easily.

Also, evidence suggests that an explicit approach to teaching collocations would be ideal (see Barghamadi et al., 2022). Therefore, incongruent items require a direct approach to pedagogical implications for L2 MWU learning to increase learners' attention. In this light, the present study follows Webb and Nation's (2017) view. They noted two essential conditions for learning vocabulary: repetition (quantity of word meetings) and mental processing of those meetings or "quality of attention" that includes noticing, receptive, and productive retrieval (Nation, 2020, p. 23). Since a notable difference in processing quality is between incidental and intentional learning, with deliberate attention typically leading to substantive knowledge (Nation, 2020), an explicit approach to teaching collocations would be desirable.

In addition, the literature review and evaluation of the previous research indicated that some factors enhance and facilitate the process of collocation learning, including contrastive analysis (Laufer & Girsai, 2008), raising awareness to reduce synonym strategy (Webb & Kagimoto, 2011), frequency of exposure (Webb et al., 2013), and highlighting items in the text or semi-incidental learning (Boers & Lindstromberg, 2009). Accordingly, a list of

items requiring more study time is beneficial because of the higher learning burden associated with incongruent items and increased noticing as a first level of quality of attention. Moreover, learners with limited studying time may find this list helpful because it allows them to concentrate more on items likely to cause errors. Therefore, it could be valuable for Persian learners in developing their collocational fluency. In light of these findings, teachers may find teaching explicitly and emphasising incongruent items helpful.

Conversely, presenting only a simple list does not result in receptive retrieval as a second level of attention. This level of attention occurs when learners try to remember or recall the meaning. Nation (2020, p. 23) claims that “this can occur incidentally while reading or deliberately when working with flashcards”. Therefore, one type of intentional learning activity that occurs in receptive retrieval is flashcards, which can provide contrastive analysis and frequency of exposure to enhance the process of collocation learning. In contrast, several researchers have criticised intentional learning for not leading to fluent language production or use (Qian & Lin, 2020). While receptive retrieval occurs with flashcards, productive retrieval does not happen. L2 learners use productive retrieval when recalling a word correctly in written or spoken form to express meaning.

Therefore, simple flashcards also do not provide productive retrieval when L2 learners need to express meaning in spoken and written form. They need to know how to use MWUs in production retrieval. However, the literature reviews indicated that flashcards are valuable tools for learning MWUs if well-designed to aid L2 learners. Therefore, flashcards deserve to be a practical tool if they illustrate how to use items in sentences. The present study recommends using digital flashcards incorporating sentence examples to support receptive and productive retrieval. It is noteworthy, however, that paper-based flashcards are confronted with the challenge of providing all essential elements, including translation and example sentences, on a single card.

Research on the role of CALL and vocabulary learning indicates that explicit approaches to vocabulary learning have become more prevalent since incidental vocabulary acquisition is no longer seen as an effective way to learn new words (Godwin-Jones, 2010).

Since several studies have shown considerable improvements in vocabulary knowledge among Iranian EFL learners via CALL (e.g., Dashtestani, 2016; Mirzaei, 2022), digital flashcards would be an ideal software to teach incongruent MWUs explicitly. Using digital flashcards while studying might encourage students to recall word forms and meanings, and designers can include additional sides and examples for each item to create more significant context.

In addition, by assessing the collocational knowledge of Persian-speaking learners, the present study bears important implications for language teaching and curriculum development, as well as for educators and materials developers. The findings reveal that a practical pedagogical approach to teaching collocations entails considering factors such as congruency, semantic transparency, frequency, and proficiency levels in MWU selection. In doing so, instructional materials can be designed to prioritise high-frequency word collocations, maximise learners' exposure to commonly used sequences, and facilitate their acquisition. Furthermore, the study emphasises the positive correlation between proficiency level and productive MWU knowledge, highlighting the need for tailored instruction aligned with learners' language proficiency levels. Educators can use these insights to develop scaffolded learning experiences that introduce progressively more complex collocations, ensuring optimal learning outcomes. The findings also emphasise the need to incorporate contrastive analysis into language instruction to raise learners' awareness of differences between their L1 and target languages. By highlighting similarities and distinctions in word combinations, teachers can help learners navigate the complexities of collocation usage more effectively.

Moreover, identifying the challenges inherent in learning low-frequency collocations underscores the necessity for supplementing existing EFL materials with targeted resources that address these gaps. Educators can enhance learners' proficiency and fluency in the target language by providing ample opportunities to practice and internalise relatively common collocations. Taken together, the practical implications of this research extend

beyond the classroom, providing valuable guidance for educators and materials developers seeking to optimise language learning experiences and facilitate learners' mastery of MWUs.

In sum, even if the MWU studies were classified into intentional and incidental learning, psycholinguistics approaches, and corpus approaches, the results consistently pointed to the challenge of learning MWUs by relying solely on L1 traces as the primary source of errors and difficulties. This view solidified the consensus within collocations research that L1 - L2 congruency is pivotal. Scholars widely advocate for prioritising collocations that align with both languages, as it enhances explicit learning and enables students to navigate potential pitfalls and reduce the likelihood of errors (e.g., Laufer & Waldman, 2011). By carefully curating materials that emphasise this congruency, instructors empower students to focus on areas where they would otherwise be more susceptible to making mistakes.

Consequently, this data may highlight the necessity for custom-tailored resources specifically adapted for particular learner groups instead of generic L2 learning materials created for all learners. It is possible to use the findings of this study as supplementary study materials through Leitner algorithm-based spaced repetition software, as Rogers (2017b) did for the Department of Foreign Languages at a Japanese university. Therefore, a contrastive analysis might help design bilingual resources by considering low L1 - L2 ratings. Likewise, this study's results will be helpful for textbook writers who intend to develop materials for Persian-speaking English learners. By introducing and highlighting MWUs in textbooks and providing their Persian translations in the margins, textbook writers can play a crucial role in enhancing the learners' understanding of high-frequency vocabulary and its interaction.

6.4 Towards Effective Language Pedagogy

Contemporary educational literature has noted the predominant emphasis on isolated vocabulary within textbooks. However, a paradigm shift is imperative, as scholarly investigations have consistently revealed that the acquisition of collocations necessitates an experiential approach beyond the confines of traditional vocabulary exercises. Notably,

learners exhibit a limited propensity to discern collocations organically without explicit direction. It is imperative for EFL textbooks and authentic materials to incorporate a more comprehensive array of MWUs and, correspondingly, to direct learners' attention towards these linguistic constructs. Moreover, a critical deficiency in existing materials is identified, wherein the integration of MWUs is insufficient, impeding learners' proficiency in recognising and utilising collocations effectively.

To address this pedagogical gap, strategic implementation of techniques to elevate the salience of MWUs is warranted. Approaches such as underlining or highlighting within instructional materials emerge as viable mechanisms for directing learners' attention towards collocations (Majuddin et al., 2021; Szudarski & Carter, 2016). While these methods have demonstrated efficacy in facilitating the incidental acquisition of vocabulary, incidental learning MWUs are likely to take much work since exposure intervals may be too large for learners to receive them via incidental activities (Boers & Lindstromberg, 2009).

Implementing targeted learning strategies is pivotal in enhancing language acquisition efficiency, particularly in MWUs. Recognising new MWUs, incorporating repetition, and fostering frequent encounters with these linguistic constructs constitute indispensable components of a pedagogical framework geared towards optimal learning outcomes. Scholars such as Şen (2019) and Tsai (2015) advocate including collocation lists as invaluable tools for language learners, thereby underscoring the significance of deliberate attention to MWUs. However, material developers and educators must approach the deployment of collocation lists and related intentional activities with a nuanced perspective. Notwithstanding their potential benefits, collocation lists and flashcards are intrinsically decontextualised. This inherent limitation raises a valid critique, positing that these resources may fail to enable learners to deploy MWUs authentically within contextualised linguistic settings.

The critical examination of deliberate learning methodologies underscores the necessity for a balanced approach. While collocation lists and flashcards undeniably contribute to the recognition and memorisation of MWUs, the challenge lies in translating this

knowledge into practical, contextually appropriate usage. Hence, this research proposes a comprehensive language learning curriculum that integrates explicit learning tools supplemented by context-rich exercises. This approach fosters a holistic comprehension of collocations.

The advent of advanced technology heralds a paradigm shift in pedagogical materials. Importantly, it presents a promising avenue for transforming conventional resources into dynamic, digital formats. Integrating digital platforms into language learning materials can revolutionise the efficacy of collocation resources, transcending the limitations inherent in traditional, paper-based materials. Developing well-designed digital formats constitutes a key catalyst in elevating the efficiency of collocation materials. By leveraging technological capabilities, these formats can engage learners in interactive and immersive experiences, fostering more robust retention of word forms and meanings. The inherent interactivity of digital resources motivates learners and facilitates a more active cognitive engagement, promoting a deeper understanding and recall of collocational patterns.

Moreover, the digital realm offers many options to address the drawbacks associated with traditional materials. The dynamic nature of digital platforms allows for adaptive learning experiences, tailoring content to individual learner needs and preferences. Additionally, multimedia elements, such as audio-visual aids and interactive exercises, can be seamlessly integrated to provide a multi-sensory learning experience, catering to diverse learning styles and enhancing comprehension. The shift towards digital formats in collocation materials signifies a progressive stride in language pedagogy. The potential of technology to optimise learning outcomes lies in its capacity to not only overcome the limitations of traditional resources but also to offer a versatile and engaging platform that aligns with the evolving needs and expectations of contemporary learners. Embracing well-designed digital formats promises to enhance the efficiency of collocation materials and invigorate the overall language-learning experience.

The current study, framed as a replication endeavour, aimed to contribute to the linguistic pedagogy landscape by generating a Persian version of high-frequency

collocations in general English. This compilation is meticulously crafted based on the congruency with all MWUs translations and accompanying example sentences. Notably, the absence of a congruency-based high-frequency collocation list for Persian-speaking English learners prompted the development of Persian translations for all MWUs and corresponding example sentences, fulfilling a critical gap in the existing research landscape.

Building upon the thesis objectives, the research aligns with the findings of Durrant and Schmitt (2009), who underscored the heightened need for non-native learners to receive ample input for effective collocational acquisition. The study concurs with their conclusion that "fluency-oriented repetition of individual sentence contexts" proves more efficacious in collocation learning than exposure in varied settings. Consequently, the integration of example sentences, as advocated by Durrant and Schmitt, emerges as a pedagogically sound strategy, affording students a contextualised and iterative exposure to collocational patterns.

Moreover, drawing from the insights of Laufer and Girsai (2008), the research acknowledges the advantages of incorporating L1 translation in the language learning process. Explicit contrastive analysis and translation activities outperformed other instructional methods, emphasising the significance of L1 - L2 congruency awareness. Consequently, the study advocates for the judicious selection and translation of the most frequently occurring MWUs into the learners' native language, thereby facilitating a nuanced understanding of collocations with optimal congruency. Recognising the practical implications of the generated list, the study anticipates its value for learners and practitioners in the ESL/EFL domain. The compiled resource holds potential utility as a reference for creating diverse educational materials, ranging from textbooks to bilingual collocational dictionaries and educational software. Notably, the juxtaposition of contrasts between English and other target languages, while complex for heterogeneous learner groups, becomes more straightforward in the context of a homogenous set of L2 learners.

Although the current study aimed to create freely available digital collocation flashcards for 4.600 MWUs with low L1 - L2 congruency, finding a free version with two

salient options consisting of multiple sides and a Leitner algorithm and supporting this large-scale list was challenging. For instance, the summary of the Quizlet evaluation demonstrated that it is easy to use, supports learners to be autonomous, is an excellent resource to be shared between teachers and learners, and enables teachers to track students' progress (Dizon & Tang, 2017; Nakata, 2011; Sanosi, 2018). Conversely, it has two sides, and it is helpful to create old-fashioned cards that include one side for the target word and the other for L1 translations or additional information, such as part of speech.

In comparison, with three sides, Anki has been designed for learners and individual users. The data may be deleted if learners have not accessed their account or synced in the last six months. Therefore, it is helpful for learners to create their own flashcards, but it is inappropriate for researchers or the current study. In addition, some flashcards have free options for a limited list and payable or premium options for an extensive list.

On the other hand, the target participants are Iranian language learners who struggle with international transactions. While Flashcards Deluxe (Thomason, n.d.) is not free like many flashcards, the cost is reasonably priced compared to other programs with an upfront fee to buy the app. This study chose Flashcards Deluxe to create digital flashcards because it can be maintained as a permanent shared library. Moreover, the dominant reasons for selecting this app are summarised below:

- It has the Leitner algorithm and a more advanced spaced repetition mode.
- It consists of five sides.
- A large number of cards (10,000+) can be imported easily.
- Internet connection is optional to study.
- The app can add pictures and sounds.
- It is one of the cheapest apps.

Therefore, this research introduces a valuable resource that is available for download on Android and iPhone. Also, this list could be a resource for Afghan and Tajiki learners due to its massive similarity with Persian. Harnessing the insights discussed, developing a free

web-based resource becomes a powerful solution for Persian-speaking learners. Utilising the identified list, learners gain access to a tailored platform where they can use existing lists and create their own flashcards. This approach democratises access to educational materials and empowers learners to engage actively in their language acquisition journey. The versatility of a web-based resource ensures accessibility for all, fostering a collaborative and dynamic learning environment for Persian-speaking learners (see Figure 19). To make this web-based option, the researcher attempted to improve the quality of the website with extra options. Since this list is a large-scale list, the ranking system was defined to deal with such an extensive list for managing for study. For instance, if the learners studied the first 20 most frequent items, the next time they enter a number such as 21, they will get the items with rank 21 in the most frequent items in the list and keep going to study. This option allows for conveniently managing a list with 4,600 items, which is essential to support learners in continuing their studies for another search. Here is the link to *General English Phrases* (<http://secureapp.au/4600/>) and the platform screenshot:

Figure 19

Screenshot from Web-based General English Phrases for Rank 10



English phrase with Persian translation

[Back to list](#)

Rank	10
Frequency	37387
Collocate	no
POS	r
Pivot Word	long
POS	r
Multi-Word Unit	no longer
Persian Translation	دیگر نه
Example Sentence	I am no longer a member of the university soccer team. I quit last week.
Persian Translation of Sentence	من دیگر عضو تیم فوتبال دانشگاه نیستم. هفته گذشته ترک کردم.

Activate Windows
Go to Settings to activate Windows.

In conclusion, the methodologies employed in this research, encompassing congruency-based compilation, fluency-oriented repetition, and L1 - L2 contrastive analysis, converge to contribute a valuable resource to the ESL/EFL pedagogy field. This resource's envisaged applications extend beyond immediate use. It will permeate diverse educational materials and serve as a foundational reference for instructors and material writers navigating the evolving language education landscape.

6.5 Contributions to Theory and Practice

This research provides significant theoretical and practical contributions concerning collocational knowledge, identification, and teaching, which were not prominent before. Theoretically, the Lexical Approach, contrastive analysis, and post-method were highlighted to reach the objective of the present study. Based on the Lexical Approach, collocations are given significant focus; words are provided to the student as familiar chunks rather than isolated vocabulary, and the ability to produce chunks directly correlates with language learning. According to this method, increasing the knowledge of lexical expressions, collocational power and mastery of essential words and linguistic structures of learners increases competence and communicative capacity (Lewis, 1993). Once the Lexical Approach is adopted, one may explore language radically differently. From this perspective,

"language consists of grammaticalised lexis, not lexicalised grammar" (Lewis, 1993, p. vi). Thus, the lexis is a fundamental aspect of generating meaning, and grammar plays a secondary role in handling meaning. Therefore, the Lexical Approach was the best approach for the objectives of the current study.

There is a notable alignment between the post-method approach and contrastive analysis, mainly when both focus on the learner's L1. Both methodologies acknowledge the significance of understanding the learner's linguistic background to tailor effective teaching strategies (Lado, 1957; Stern, 1992). Post-method pedagogy prioritises flexibility and adaptability in teaching, whereas contrastive analysis systematically compares L1 and the target language to predict and address potential challenges. Together, they form a cohesive framework that recognises the pivotal role of L1 influence in language learning and seeks to leverage this understanding for more effective and personalised instruction. To quote Stern (1992), in the post-method, the "L1 - L2 connection is an indisputable fact of life" (p. 282). Hence, using L1 could support learners in learning more MWUs that are impossible to explain. In addition, contrastive analysis is the dominant view in the present study. This perspective begins by outlining the learner's errors. It also serves as a data source for the target language teachers to identify the systemic areas they wish to consider.

Controversially, the influence and perspective of contrastive analysis have diminished, as it has been recognised that not all errors stem from L1 interference or language transfer. This acknowledgement highlights the complexity of language learning, with errors often arising from diverse factors beyond the influence of the learner's native language. As a result, there is a shift towards a more nuanced understanding, emphasising a broader range of contributors to errors and encouraging a holistic approach to address the intricacies of language acquisition. This evolving perspective encourages educators to consider a more comprehensive view when analysing and addressing language errors.

Therefore, new areas of interest have emerged due to the drawbacks of contrastive analysis. These areas include error analysis, cross-linguistic influence, and the function of L1 in the cognitive approach, which may provide more evidence to support the claim that L1

influences the acquisition of L2. Such new perspectives could also be another supportive evidence to highlight contrastive analysis and follow this perspective for the goal of the present study. Contrastive analysis proponents think it will help create bilingual L2 materials and identify L2 learners' errors and difficulties. Since this research aimed to develop a new resource based on selecting frequently co-occurring language elements that deserve to be taught explicitly, the contrastive analysis would be an appropriate approach besides the Lexical Approach.

The present research contributed to the theory of MWUs and attempted to operationalise MWUs that consist of a pivot word or node word and a collocate via the combination of frequency of co-occurrence as a traditional view and lemmatised concgramming method as a modern perspective. From this perspective, MWUs and collocations are a single entity regardless of whether they are idioms or phrasal verbs. Also, they are the same classification regardless of whether they are compositional (literal) or non-compositional (opaque).

This study has not only contributed to the theory of MWUs / collocations by clarifying what a collocation is and is not, but it has also provided practical guidance for language teaching. The various collocation analysis methods and research in this field, each with its valid definition of collocation, have been explored. However, the study's findings provided some recommendations from the perspective of EFL/ESL scholars, teachers, and students, with the practical goal of determining which multicomponent language elements need to be explicitly taught to help learners acquire L2 collocational knowledge effectively. The literature review has indicated that the most effective way to study MWUs is by considering them as holistic units rather than individual components. Given the impossibility of teaching all items, the most reasonable approach would be to select the most valuable items and teach them directly as chunks, empowering teachers and students with a practical and effective teaching method.

When the pattern of high-frequency word combinations is analysed, and the MWUs that most represent such combinations are identified, it is clear that most of these are

transparent formulations. Some scholars do not consider such formulations as collocations and do not feel they deserve special training because opaque or non-compositional formulations (e.g., figurative, semi-figurative, idiomatic) have a significantly higher learning burden, and these items should be considered as collocations or deserve to be taught explicitly. Such a view of linguistic phenomena is logical and appropriate; it should not be condemned. However, the aim of the present study was not to describe or precisely define any concepts. Instead, the focus was on identifying high-frequency lexical patterns that co-occur in L2 proficiency to help learners master using them correctly.

Practically, this research aimed to reveal how high-frequency vocabulary co-occurs to assist learners in understanding how to use it correctly and, as a result, achieve a high level of communication. Therefore, the main objective was to select a list of high-frequency MWUs that deserve more teaching time and attention. This study showed that this approach would be problematic if researchers were to accept opaque items as collocations, as it would reduce the size of the list of high-frequency MWUs. The cases identified in this study are only a minority of non-literal formulas (1,580), so vocabulary is significantly lost. Researchers agree that native speakers' lexicons can contain hundreds of thousands of collocations. In a recent study, Brysbaert et al. (2016) discovered that one American English native speaker identified 42,000 lemmas and 4,200 multi-word phrases. Therefore, using approximately 1,500 non-literal formulas identified in the current study is insufficient for achieving collocational fluency since such knowledge takes years to master.

Suppose literal items are not collocations but incongruent with the learners' L1. In this study, 3,400 items were classified as literal with an L1 - L2 rating of six and below, and only 1,000 of these items rated six and below were opaque. That means most of these items were still incongruent with the Persian translation but classified as the literal formulation. Indeed, opting to include even the opaque items with low L1 - L2 congruency ratings is a strategic move, albeit one that significantly trims down the list size. This decision, while potentially narrowing the scope, reflects a deliberate focus on challenging and less congruent collocations. On the other hand, incongruent items will be a source of errors for L2

learners if the learners rely on L1 to translate from word to word into the L2 collocations due to cross-linguistics issues.

Even the subject of collocations has been a concern of English translators in various contexts when relying on L1 to translate from word to word, which leads to unacceptable collocations. While the literal translation was the most frequently used strategy for translating English collocations into Persian (Dastmard et al., 2016), there was a greater likelihood of a natural rendering for congruent collocations and collocations with transparent meanings for Arabic translators (Sonbul et al., 2023). It could be another supportive evidence to focus on congruency in the translation classroom. Accordingly, in the role of an educator, it is incumbent upon one to ensure that students can produce accurate and error-free structures.

To this end, this research proposes that teachers provide resources tailored to their students' specific needs and goals. This may require a more significant investment of time and energy on the part of the teacher in creating such resources. Therefore, educators must devote themselves to creating resources that will assist their students in attaining their objectives. Considering the need analysis, collocations, whether or not they are transparent or opaque, are required to be identified via a lemmatised concgram and taught explicitly based on L1 - L2 congruency.

6.6 Limitations

This current research was a first step toward creating a resource to assist Persian learners in improving their English collocational fluency with better efficacy. As conceptual replication research, the present study aimed to follow Rogers's work (2017a) and the procedures adopted in the original study to provide materials for Persian students to learn MWUs. This research represented a new perspective on creating MWU materials and teaching to help L2 learners acquire MWU knowledge. It is essential to acknowledge the limitations surrounding the interpretation, application, and reliability of the findings of this study. Every research effort has limitations; recognising these is critical for future research.

First and foremost, this study utilised the 11,212 MWUs list based on LCM as a novel method for the starting point. However, several helpful vocabulary lists, such as the BNC/COCA List (Nation, 2012), were generally used in collocational research. This research selected Rogers's (2017a) list for several reasons. In summary, the sole extensive lemmatised MWU list that considers essential components employs the lemmatised concgramming method to eliminate redundant entries. This list was also used since a Japanese foreign language faculty department adopted it as a formal element of obligatory study for all first- and second-year students. The data was used in this capacity for six years, showing that students who spent the most time studying the material improved the most on their Test of English for International Communication (TOEIC) scores (Rogers, 2017b). Also, Rogers (2017a) discovered a strong correlation between students' resource quiz scores and TOEIC scores. Therefore, it cannot be validated by comparison with other studies. As mentioned in the research design, the present study is a replication study and, in more stages, was compared with the original research.

Regarding the L1 - L2 congruency rating, this large-scale list was translated into Persian and rated based on the 12/12 system. The rating process includes a subjective component, albeit an unavoidable one. Since most items consisted of four words, 12/12 points were easy to divide. However, some items had more than four words, and their points were rounded due to consistency. Additionally, only one translator (PhD candidate) was available due to the size of the study. An ideal scenario would be to have multiple raters check the translations and then conduct an inter-rater reliability analysis on the entire list. Although inter-rater reliability was extremely high at 96% on 10% of the list with another rater and a high ratio of items were classified as incongruent with Persian, the results should be considered cautiously. In light of this, future research should validate the study's starting point by confirming the translations and ratings of the 11,212 MWUs.

However, the results of this study could be a starting point for conducting more research with different L1s; this aspect of the study has the apparent limitation of applying only to Persian-speaking learners. The outcomes will vary significantly based on the L1. This

means that part of the research cannot be used with other students. Although it is ideal to do L1 congruency analysis with other L1s, given the scale of this investigation, it needed to be more realistic.

While it was impossible to run L1 - L2 congruency with different raters, the entire list was classified based on semantic transparency by the researcher and a native English speaker with long experience as an English teacher. Although the inter-rater reliability was 97%, semantic transparency judgements are subjective. There may be problems with replicability and reliability since other classifications exist with some researchers in the phraseological approach that could indicate different results (Cowie, 1988, 1994, 2001; Howarth, 1998). If the target of the study were to examine the role of semantic transparency in the collocations learning process, as Yamashita (2018) did, the taxonomy type would be an influential factor to consider. Nevertheless, the present study attempted to find whether semantically opaque items or L1 - L2 congruency require teaching explicitly. Therefore, classifying items into literal and opaque items would be valuable to research the study's objective (Grant & Nation, 2006; Nation, 2020).

Considering creating a digital MWU resource, the literature review revealed that low L1 - L2 ratings should be taught explicitly, and flashcards would be an efficient tool if they are well designed and used the potential of CALL to provide cards with more sides. However, this study is not commercial research to create its flashcards. Finding a free flashcard app to support this large-scale study was impossible. There are some free apps, but some have a limited number of cards, and some are created for individual users that require frequent study to keep the materials safe on the platform.

In addition, one aspect of creating material based on needs analysis is considering all impact factors. Accordingly, the target group was the Persian learners limited to international transactions; hence, creating a free app would increase the opportunity for Iranian L2 learners to use this resource. Consequently, this study developed a flashcard app that demanded buying the app and downloading the flashcard with a small expenditure besides free web-based material. This free web-based resource would be a significant

chance for the target group to access and study the items with all translations and example sentences. Furthermore, in acknowledging the multifaceted features of certain free apps like Anki, which incorporate multiple sides and spaced repetition, the study recommends that Persian speakers leverage the web resource to craft personalised flashcards.

In line with the design of a MWU test, one area for improvement in the present research pertains to the selection of sample items and the sample rate. Schmitt et al. (2001) recommend 30 items per 1,000 frequency level for reliable results. However, more than 30 items would adversely affect practicality due to their length (Gyllstad, 2020). On the other hand, each frequency level in this research consisted of 2,800 items and eight items from each band were selected, resulting in a substantial total of 32 items in the MWU test. Therefore, future research should be conducted with more items from this list or using several tests based on this list.

The study's limitation in selecting items based on specific criteria, such as L1 - L2 congruency, semantic transparency, proficiency, and frequency level, is an important consideration. The decision to classify items into incongruent and congruent categories based on a six-point scale introduces a simplification that may only partially capture the nuances of different congruency levels. A more diverse selection across various congruency levels could provide a richer understanding of learners' challenges.

Similarly, the dichotomy in semantic transparency, categorising items as literal or opaque, may need to be more accurate in the complexity of transparency classifications. Recognising this limitation suggests that future research should explore and assess other types of transparency classifications to offer a more nuanced and comprehensive perspective on how learners navigate different semantic complexities. Acknowledging and addressing these limitations contribute to refining and improving research methodologies for a more accurate representation of language learning.

The current study delved exclusively into probing the productive knowledge of collocations, inadvertently overlooking the equally crucial aspect of receptive knowledge. While productive knowledge is a targeted focus due to its efficiency in item selection,

administration, and evaluation, neglecting receptive collocation knowledge presents a notable gap. Educators and researchers often leverage receptive knowledge, as demonstrated by Nguyen and Webb (2017), who efficiently assessed Vietnamese learners using 180 items. Recognising this omission, a subsequent study dedicated to receptive knowledge of collocations would provide valuable insights, allowing for selecting and evaluating a more extensive array of items. Such an exploration would contribute significantly to comprehensively understanding learners' collocational competence.

The COVID-19 pandemic presented challenges to data collection, resulting in a smaller sample size than initially anticipated (approximately 280 participants). However, the restrictions only allowed access to students majoring in English. This group could affect the results because some have teaching experience and more exposure to English words. Collecting data from students with diverse academic backgrounds could provide a more comprehensive understanding of the subject matter and help alleviate some of the constraints of this research. It would be advantageous to expand our participant pool beyond English majors to address this limitation and enhance the depth of our study.

By examining Persian speakers' familiarity with MWUs and their performance on the general IELTS test, this research aims to provide valuable insights into the relationship between MWU knowledge and English language proficiency levels. Using general IELTS scores as a metric for determining proficiency levels amongst Persian speakers is common. However, the study's reliance on self-reported IELTS scores could introduce bias; obtaining official scores would ensure more accurate proficiency measurement. It is essential to acknowledge the inherent limitations associated with using this standardised test to measure English language proficiency within the context of this study.

While the IELTS test is widely recognised and utilised for evaluating English language skills (Gagen & Faez, 2023), its design and objectives may not fully align with the specific focus of this research. The creators of the IELTS test do not claim that the test is an all-encompassing measure of language proficiency (Gagen & Faez, 2023). Instead, it is a

standardised assessment tool for evaluating general language skills across four key domains: listening, reading, writing, and speaking.

The cautionary reminder that just because people use the test for specific outcomes does not mean the test was created to do this underscores the need to carefully consider the appropriateness of using IELTS scores to assess proficiency in the comprehension and usage of MWUs among Persian language speakers. While IELTS scores may provide valuable insights into overall language proficiency, they may not accurately assess participants' proficiency, specifically in MWU comprehension and usage.

Considering the proficiency level of participants based on their IELTS scores, several additional limitations should be acknowledged. IELTS is widely recognised as a reliable measure of English language proficiency, but its validity in assessing participants' language skills within the specific context of this study may be limited. The test evaluates general language proficiency and may not fully capture the language abilities required for the research tasks or interactions. Although IELTS scores offer a standardised language proficiency assessment, test-taker variability and test administration conditions may affect score reliability (Müller & Han, 2022). Variations in test-taking strategies, test preparation, and test administration procedures could introduce inconsistencies in interpreting participants' language proficiency levels. Moreover, participants' language proficiency levels may fluctuate over time, and other contextual factors, such as language exposure and language learning experiences, could influence their language abilities beyond what the IELTS scores capture.

Moreover, the emphasis on overall scores in the general IELTS test may overlook variations in proficiency across its four key domains (listening, reading, writing, and speaking), impacting participants' performance in specific research tasks or interactions requiring targeted language skills (Gagen & Faez, 2023). Lastly, it is essential to recognise that various non-linguistic factors, such as motivation, cultural background, and educational experiences, influence language proficiency. While IELTS scores provide a quantitative measure of language proficiency, they may not fully capture the complex interplay of these

factors in shaping participants' language abilities within the research context. Given these limitations, alternative approaches or supplementary measures will be considered to validate further the findings related to MWU comprehension and usage among Persian language speakers in this study.

Also, the present study honed in on explicitly teaching collocations to enhance fluency, with participant assessment as a secondary objective. This allows future investigations to unearth additional factors influencing collocational competence. In addition, these could encompass the prioritisation of single-word knowledge and the impact of L2 exposure, shedding light on broader facets that play a role in developing collocational proficiency. This suggests a rich avenue for future research endeavours, expanding the scope of inquiry and offering a more holistic comprehension of language learning dynamics.

6.7 Directions for Future Research

More research should either expand on what was done in this study or refute the present research findings and find better, more practical, and more efficient ways of identifying MWUs. As discussed previously, numerous limitations within this study indicate that future research could be conducted in several directions. In this regard, conducting an inter-rater reliability analysis on the entire list would be great. Two or more translators could be employed, and the whole list could be rated. Considering the different types of transparency classification and utilising other taxonomies would change the view of this perspective and alternate the role of literal formulations. Besides limitations, some guidance for further studies was noted in section 6.5. In addition, this section provides a foundation for future research.

First, this study attempted to run a contrastive analysis with Persian. Various studies in different contexts illustrated that L2 collocations are learned and processed based on congruency, and more errors occurred due to L1 interference. Conducting L1 - L2 contrastive analysis for other languages would be valuable and ideal. Hence, looking closely

and exploring more based on similarities and differences between English and other languages would be a pathway to lead L2 learners and develop efficient EFL/ESL resources.

Also, this data may highlight the necessity for custom-tailored resources specifically adapted for particular learner groups instead of generic L2 learning materials created for all learners. While most textbooks are created for heterogeneous EFL/ESL students with various L1s, generating materials based on the contrasts between English and other languages is straightforward for a homogenous set of L2 learners. However, creating this type of material still needs more research. Also, much work remains to determine how to teach these items. Based on evidence from the literature review, this study noted that these items should be taught explicitly, and flashcards would be a great tool. Therefore, future research should investigate how to teach the identified entities in this study. Also, further research on using its web-based items and the flashcards with Persian-speaking learners might indicate additional insight.

There is also potential to consider further research on testing MWUs and influential factors. According to Gyllstad and Schmitt (2018), MWUs are more challenging and complex to assess than individual words. Consequently, no standard test or method has been established to measure MWUs, and no consensus has been reached about how best to measure them. Thus, creating standardised tests of MWUs could be a flourishing target for further research. Based on this study, the output was a large-scale study with a list of 11,212 items; a longitudinal study or multiple tests should be designed to select more items from the frequency bands and consider other factors besides congruency and transparency.

Regarding statistical analysis, the current study ran multiple regression analyses. If the target of the investigation were to explore the process of learning collocation, mixed-effects modelling would be beneficial in creating more information. This analysis can address the shortcomings associated with the methods used to perform the research in the original study and add additional evidence to our understanding of the influential factors such as L1 congruency, semantic transparency, and frequency.

While the current research focuses on identifying high-frequency collocations for direct teaching to ESL/EFL learners, there are several potential avenues for future studies to explore in teaching and learning these items via flashcards. It is important to acknowledge certain limitations and questions that may arise, which could serve as valuable areas for future investigation, such as the following:

- What about flashcards' potential limitations in providing only receptive retrieval and not productive retrieval?
- Is it possible that L2 learners may need to know how to use MWUs in production retrieval and how flashcards can aid in this aspect?
- What would address the criticism that intentional learning, such as flashcards, may not lead to fluent language production or use?

Numerous pivotal questions, among those mentioned, linger without definitive answers. Addressing these inquiries holds the key to dismantling barriers that impede learners on their journey toward achieving collocational fluency. Consequently, there is an imperative need for additional studies to delve into the value of this specific type of flashcard and investigate the underlying processes involved in learning collocations. By embarking on further investigations, researchers can uncover valuable insights into the effectiveness of flashcards as a pedagogical tool for mastering collocations. This exploration could illuminate the optimal design, implementation, and integration of flashcards into language learning curricula, offering practical solutions for educators and learners alike. Pursuing a more profound understanding of the learning processes associated with collocations is a crucial step toward refining language education strategies and ultimately enhancing learners' proficiency in this nuanced aspect of linguistic competence

6.8 Thesis Summary

The rationale behind this research was to identify fundamental criteria for selecting high-frequency MWUs to teach explicitly and create a rescore based on the findings. Knowledge of MWUs plays a central role in helping the learner achieve a high level of communication

and become more natural. Having MWU knowledge aids L2 learners in avoiding errors like those made when they attempt to directly translate word combinations from their L1 that are expressed differently in the L2. Also, L2 learners may need clarification because the word combination parts sometimes equal the sum by using the literal processing of words.

Although researchers have agreed on the significance of MWUs for a long time, these still involve challenging concepts. From the evidence, there needs to be better resources in this area, and instructors and material creators have been unable to comprehensively assist learners in studying this knowledge due to this lack of resources. It is also troublesome when the issues surrounding MWUs are not highlighted in learning materials since prior studies have demonstrated that for students to retain such knowledge, their attention must be drawn to it. Due to insufficient exposure, L2 learners worldwide need more explicit collocational education.

From the commencement of the current study, there has yet to be a universal definition for the concept of MWUs / collocations and what should or should not be part of this definition. The target of this research was not to find a valuable conceptualisation for this concept. However, the present study sought to identify the fundamental criterion for selecting items requiring more teaching time. Rogers's (2017a) list of 11,212 high-frequency MWUs as a starting point was chosen to achieve this goal. This list has several advantages. This list was elicited from COCA as one of the largest corpora. To identify the most exemplary MWUs for high-frequency, the lemmatised concgramming method was utilised, along with various factors such as frequency, mutual information, dispersion, and chronological data. Therefore, Rogers's list was chosen in this study since it was the most extensive one ever produced for L2 learners using the most recent technique for identifying MWUs.

From a diverse viewpoint, L1 - L2 congruency was proposed as a leading issue in raising learners' awareness of the similarities and differences between English and other languages. Accordingly, L1 - L2 contrastive analysis was conducted by translating 11,212 MWU items into Persian to identify incongruent items presenting a more significant learning burden. This stage allowed for identifying incongruent items that teachers might

subsequently choose and which items deserve more time in class. However, it was a large-scale list and challenging to translate into the target language; all sample examples of each MWU were also translated to create a new MWU material for Persian-speaking English learners. The results revealed that a high ratio of items was incongruent with Persian. Since previous research emphasised that low L1 - L2 congruency has a learning burden and is a source of errors for L2 learners (e.g., Davoudi & Behshad, 2015; Laufer & Waldman, 2011), selecting such items would provide valuable items that need more study time and attention.

The next step was to determine and confirm whether semantic transparency is a fundamental criterion for selecting useful English MWUs to teach explicitly. Conducting a semantic transparency study was a further step required since MWUs can also considerably alter their learning burden. Therefore, all items were classified from literal to non-literal. Results regarding transparency indicated that the majority of items were literal. Hence, teaching high-frequency vocabulary and developing collocational knowledge of literal formulations becomes necessary.

Therefore, the findings of the present research confirm that L1 - L2 congruency is the leading and fundamental criterion for selecting items for teaching explicitly. While the low L1 congruency items have a learning burden and limit the size of the list, the items with a cut-off of six were gathered in the final list. Furthermore, it was found that more than a simple list of MWUs was needed to be given to the students because the study's ultimate objective was to address the practical requirements of students. Recognising how to use MWUs in sentences or contexts is essential. Therefore, all MWUs with their example sentences were employed in the list and digital formats.

In the final step, this research aimed to investigate Persian English learners' knowledge of MWUs by considering whether or not congruency, transparency, item frequency, and proficiency level influence this knowledge. The productive knowledge test was designed with balanced items from frequency bands. These findings were then examined to see if the abovementioned variables affected participants' knowledge of them. The results showed a positive relationship between proficiency level and MWU knowledge.

Increasing the proficiency level leads to advanced knowledge of MWUs. As expected, a decrease was found in learners' collocational knowledge over the four frequency levels (high to low). This finding suggests that Persian teachers are recommended to consider more high-frequent items and move to low-frequent items.

As expected, the participants performed better on congruent and literal items by obtaining higher scores on these items rather than incongruent items and opaque items. Significant interaction was found since the abovementioned variables were only between the congruency effect and proficiency level. However, opaque items were challenging, but the number of opaque items was significantly less than incongruent items. It would be another supportive evidence to focus on teaching incongruent items directly and explicitly.

Overall, the findings have some limitations and need cautious interpretation. However, the present study fills a gap in collocational research. The study's primary objective was to create a valuable resource for particular English learners. This study highlighted the necessity for custom-tailored resources adapted for specific learner groups instead of generic L2 learning materials designed for all learners. The resultant resource has the potential to be expanded to create other formats of materials (such as textbooks) or utilised to create for other L1 languages by running L1 - L2 contrastive analysis.

In addition, this project was highly time-consuming in running the L1 - L2 contrastive analysis. Developing some technological solutions would reduce the time and improve the methods. Now that the items identified in this study are clear, it will be interesting to see what happens when they are explicitly taught beyond using digital flashcards. Exploring how to effectively utilise flashcards and web-based materials in the study of MWUs added an intriguing dimension to the current research. Understanding the timing of mastering these tools, identifying the most effective study methods, and their impact on standardised tests are valuable questions that warrant further investigation. The dynamic landscape of language learning tools opens avenues for innovative and tailored approaches, and delving deeper into these aspects can uncover valuable insights.

In terms of pedagogical implications, the current study highlighted that teachers and instructors could find adhering to the following recommendations beneficial:

- MUWs are advised to teach explicitly.
- More emphasis on chunks is required instead of individual words.
- Introduce learners to both congruent and incongruent collocations.
- Creating and sorting items based on frequency and incongruent items is recommended.
- Encourage L2 learners to develop their flashcards and track their process.
- Create custom-tailored learning materials based on their first language needs.

The imperative for further study in this field is evident. The researcher earnestly hopes practitioners within this realm will engage in collaborative endeavours, collectively contributing to the advancement of students' collocational knowledge. This cooperative spirit beckons a shared commitment to continuous improvement, emphasising the communal responsibility of pushing the boundaries of language education.

This call for collaboration extends beyond theoretical exploration to the practical realm, urging practitioners to unite in developing integrated exercises. This collaborative effort is envisioned as a bridge between research insights and tangible teaching methodologies, fostering an environment where theoretical advancements directly translate into enhanced student learning experiences. In essence, the acknowledgement of the need for ongoing study is coupled with a hopeful vision for a collective and collaborative future in language education. The researcher's plea serves not only as a recognition of the complexities within the field but also as an inspiring call to action, inviting practitioners to join hands in shaping the trajectory of language learning for the benefit of students worldwide.

REFERENCES

- Ackermann, K., & Chen, Y. (2013). Developing the academic collocation list (ACL): A corpus-driven and expert-judged approach. *Journal of English for Academic Purposes*, 12(4), 235–247. <https://doi.org/10.1016/j.jeap.2013.08.002>
- Adolphs, S., & Schmitt, N. (2003). Lexical coverage of spoken discourse. *Applied Linguistics*, 24(4), 4254–38. <https://doi.org/10.1093/applin/24.4.425>
- Agu, A. G. (2022). Students switching intentions for graduate education services: examining the influence of service quality, price, and attractiveness of alternative. *Journal of Marketing for Higher Education*, 1–22. <https://doi.org/10.1080/08841241.2022.2101171>
- Alali, F. A., & Schmitt, N. (2012). Teaching formulaic sequences: The same as or different from teaching single words? *TESOL Journal*, 3(2), 1531–80. <https://doi.org/10.1002/tesj.13>
- Almela, M., & Sánchez, A. (2007). Words as 'lexical units' in learning/teaching vocabulary. *International Journal of English Studies*, 7(2), 21–40. <https://doi.org/10.6018/ijes.7.2.48961>
- Altenberg, B. (1998). On the phraseology of spoken English: The evidence of recurrent word-combinations. In A. P. Cowie (Ed.), *Phraseology: Theory, analysis and applications* (pp. 101–122). Oxford University Press.
- Altenberg, B., & Granger, S. (2002). Recent trends in cross-linguistic lexical studies. In B. Altenberg & S. Granger (Eds.), *Lexis in contrast: Corpus-based approaches* (pp. 3–48). John Benjamins.
- Al-Zahrani, M. (1998). *Knowledge of English lexical collocations among male Saudi college students majoring in English at a Saudi university* [Unpublished doctoral dissertation]. University of Pennsylvania.

- Anderson, R. C., & Freebody, P. (1981). Vocabulary knowledge. In J.T. Guthrie (Ed.), *Comprehension and teaching: Research reviews* (pp. 77–117). International Reading Association.
- Anthony, L. (2011). *AntConc* (Version 3.2.2) [Computer Software]. Tokyo, Japan: Waseda University. <http://www.antlab.sci.waseda.ac.jp/>
- Anthony, L. (2013). *AntWordPairs* [Computer software]. Tokyo, Japan.: Waseda University. Version 1.0.2 (Available on request) <https://www.laurenceanthony.net/software>
- Appleton, J. V., & King, L. (2002). Journeying from the philosophical contemplation of constructivism to the methodological pragmatics of health services research. *Journal of Advanced Nursing*, 40(6), 641–648. <https://doi.org/10.1046/j.1365-2648.2002.02424.x>
- Arnon, I., & Snider, N. (2010). More than words: Frequency effects for multi-word phrases. *Journal of memory and language*, 62(1), 67–82. <https://doi.org/10.1016/j.jml.2009.09.005>
- Assaf, M. M., Al-Jamal, D. A., Rababeh, E.Q. (2020). The effect of an electronic collocation-based instructional program on enhancing Jordian EFL tenth grade students' reading comprehension. *Educational Journal.*, 28(4), 869–888.
- Bachman, L. F. (1990). *Fundamental considerations in language testing*. Oxford University Press.
- Bahns, J. (1993). Lexical collocations: a contrastive view. *ELT Journal*, 47(1), 56–63. <https://doi.org/10.1093/elt/47.1.56>
- Bahns, J., & Eldaw, M. (1993). Should we teach ESL students collocations? *System*, 21(1), 101–114. [https://doi.org/10.1016/0346-251X\(93\)90010-E](https://doi.org/10.1016/0346-251X(93)90010-E)

- Ballance, O., & Cobb, T. (2020). Resources for learning single-word items. In S. Webb (Ed.), *The Routledge handbook of vocabulary studies* (pp. 320–335). Routledge.
<https://doi.org/10.4324/9780429291586-10>
- Barcroft, J., & Rott, S. (2010). Partial word form learning in the written mode in L2 German and Spanish. *Applied Linguistics*, 31(5), 623–650.
<https://doi.org/10.1093/applin/amq017>
- Barghamadi, M. (2020). A critical study of the principles and approaches to needs analysis. *Studies in Educational Management*, 7, 1–16.
<https://doi.org/10.32038/sem.2020.07.01>
- Barghamadi, M., Rogers, J., & Müller, A. (2022). On the learning of multi-word units via flashcard applications. *Australian Journal of Applied Linguistics*, 5(1), 1–18.
<https://doi.org/10.29140/ajal.v5n1.643>
- Barghamadi, M., Rogers, J., Arciuli, J., & Müller, A. (2023). The use of semantic transparency and L1 - L2 congruency as multi-word unit selection criteria. *Studies in English Language and Education*, 10(2), 723–740.
<https://doi.org/10.24815/siele.v10i2.28644>
- Barnbrook, G. (2009). Sinclair on collocation. In R. Moon (Ed.), *Words, grammar, text: Revisiting the work of John Sinclair* (pp. 23–38). John Benjamins Publishing.
- Bauer, L., & Nation, P. (1993). Word families. *International Journal of Lexicography*, 6(4), 253–279. <https://doi.org/10.1093/ijl/6.4.253>
- Beltrán, M. R. C., Contesse, C. A., & López, M. D. M. T. (Eds.). (2010). Vocabulary teaching and learning: introduction and overview. In *Insights into non-native vocabulary teaching and learning* (pp. 1–12). Multilingual Matters.
- Benson, M., Benson, E., & Ilson, R. (1986). *Lexicographic description of English*. Benjamins.

- Berti, B., & Pinnavalia, B. B. (2012). Towards a corpus-driven bilingual Italian-English dictionary of collocations. In R. Facchinetti (Ed.), *English dictionaries as cultural mines*. (pp. 201–223). Cambridge Scholars Publishing.
- Bestgen, Y. (2017). Beyond single-word measures: L2 writing assessment, lexical richness and formulaic competence. *System (Linköping)*, 69, 65–78.
<https://doi.org/10.1016/j.system.2017.08.004>
- Biber, D., & Conrad, S. (2001). Quantitative corpus-based research: Much more than bean counting. *TESOL Quarterly*, 35(2), 331–336. <https://doi.org/10.2307/3587653>
- Biber, D., Conrad, S., & Cortes, V. (2004). If you look at...: Lexical bundles in university teaching and textbooks. *Applied Linguistics*, 25(3), 371–405.
<https://doi.org/10.1093/applin/25.3.371>
- Biber, D., Johansson, S., Leech, G., Conrad, S., & Finegan, E. (1999). *Longman grammar of spoken and written English*. Pearson Education.
- Biskup, D. (1992). L1 influence on learners' renderings of English collocations: A Polish/German empirical study. In P. Arnaud & H. Bejoint (Eds.), *Vocabulary and Applied Linguistics* (pp. 85–93). Macmillan.
- Boers, F., & Lindstromberg, S. (2009). *Optimizing a lexical approach to instructed second language acquisition*. Palgrave Macmillan.
- Boers, F. (2020). Factors affecting the learning of multiword items. In S. Webb (Ed.), *The Routledge handbook of vocabulary studies* (pp. 143–157). Routledge.
<https://doi.org/10.4324/9780429291586-10>
- Boers, F., & Lindstromberg, S. (2005). Finding ways to make phrase-learning feasible: The mnemonic effect of alliteration. *System*, 33, 225–238.
<https://doi.org/10.1016/j.system.2004.12.007>

- Boers, F., & Lindstromberg, S. (2012). Experimental and intervention studies on formulaic sequences in a second language. *Annual Review of Applied Linguistics*, 32, 83–110. <https://doi.org/10.1017/S0267190512000050>
- Boers, F., Dang, T. C. T., & Strong, B. (2017). Comparing the effectiveness of phrase-focused exercises: A partial replication of Boers, Demecheleer, Coxhead, and Webb (2014). *Language Teaching Research: LTR*, 21(3), 362–380. <https://doi.org/10.1177/1362168816651464>
- Boers, F., Demecheleer, M., He, L., Deconinck, J., Stengers, H., & Eyckmans, J. (2017). Typographic enhancement of multiword units in second language text: Typographic enhancement of multiword units in second language text. *International Journal of Applied Linguistics*, 27(2), 448–469. <https://doi.org/10.1111/ijal.12141>
- Boers, F., Lindstromberg, S., & Eyckmans, J. (2014). Is alliteration mnemonic without awareness-raising? *Language Awareness*, 23(4), 291–303. <https://doi.org/10.1080/09658416.2013.774008>
- Boone, G., & Eyckmans, J. (2020). Attention-direction versus retrieval practice: which best fosters the productive recall of German formulaic sequences? *Vigo International Journal of Applied Linguistics*, 17, 9–34. <https://doi.org/10.35869/vial.v0i17.1463>
- Boone, G., & Eyckmans, J. (2023). Productive Collocation Knowledge in L2 German: Study Abroad and L1 Congruency. In B. L. Reynolds (Ed), *Vocabulary learning in the wild* (pp. 67–86). Springer Nature Singapore. <https://doi.org/10.1007/978-981-99-1490-6>
- Boone, G., De Wilde, V., & Eyckmans, J. (2022). A longitudinal study into learners' productive collocation knowledge in L2 German and factors affecting the learning. *Studies in Second Language Acquisition*, 45(2), 503–525. <https://doi.org/10.1017/S0272263122000377>

- Boonyasaquan, S. (2006). An analysis of collocational violations in translation. *Journal of Humanities*, 27, 79–91. <https://core.ac.uk/download/pdf/228504145.pdf>
- Brezina, V., & Gablasova, D. (2015). Is there a core general vocabulary? Introducing the New General Service List. *Applied Linguistics*, 36(1), 1–22. <https://doi.org/10.1093/applin/amt018>
- Browne, C. (2014). A new general service list: The better mousetrap we've been looking for. *Vocabulary Learning and Instruction*, 3(2), 1–10. <http://dx.doi.org/10.7820/vli.v03.2.browne>
- Brysbaert, M., Stevens, M., Mander, P., & Keuleers, E. (2016). How many words do we know? Practical estimates of vocabulary size dependent on word definition, the degree of language input and the participant's age. *Frontiers in Psychology*, 7, 1116–1116. <https://doi.org/10.3389/fpsyg.2016.01116>
- Bybee, J. L. (2006). From usage to grammar: The mind's response to repetition. *Language*, 82(4), 711–733. <https://doi.org/10.1353/lan.2006.0186>
- Chan, T. P., & Liou, H. C. (2005). Effects of web-based concordancing instruction on EFL students' learning of verb-noun collocations. *Computer-Assisted Language Learning*, 18(3), 231–251. <https://doi.org/10.1080/09588220500185769>
- Cheng, W. (2007). Concgramming: A corpus-driven approach to learning the phraseology of discipline-specific texts. *CORELL: Computer Resources for Language Learning*, 1(1), 22–35. <http://hdl.handle.net/10397/6746>
- Cheng, W., Greaves, C., & Warren, M. (2006). From n-gram to skipgram to concgram. *International Journal of Corpus Linguistics*, 11(4), 411–433. <https://doi.org/10.1075/ijcl.11.4.04che>

- Choi, S. (2017). Processing and learning of enhanced English collocations: An eye movement study. *Language Teaching Research: LTR*, 21(3), 403–426.
<https://doi.org/10.1177/1362168816653271>
- Christiansen, M. H., & Chater, N. (2016). The now-or-never bottleneck: A fundamental constraint on language. *Behavioral & Brain Sciences*, 39, e62.
<https://doi.org/10.1017/S0140525x1500031X>
- Cobb, T. (2003). Analyzing late interlanguage with learner corpora: Quebec replications of three European studies. *Canadian Modern Language Review*, 59(3), 393–423.
<https://doi.org/10.3138/cmlr.59.3.393>
- Cobb, T. (2013). *Vocabprofile*. <http://www.lextutor.ca/vp/>
- Cobb, T. (2018). From corpus to CALL: The use of technology in teaching and learning formulaic language. In A. Siyanova-Chanturia & A. Pellicer-Sánchez (Eds.), *Understanding formulaic language: A second language acquisition perspective* (pp. 192–210). Routledge.
- Cohen, L., Manion, L., & Morrison, K. (2011). *Research methods in education* (7th ed.). Routledge.
- Conklin, K., & Schmitt, N. (2012). The processing of formulaic language. *Annual Review of Applied Linguistics*, 32, 45–61. <https://doi.org/10.1017/S0267190512000074>
- Connolly, P. (2007). *Quantitative data analysis in education: A critical introduction using SPSS*. Routledge.
- Conzett, J. (2000). Integrating collocation into a reading and writing course. In M. Lewis (Ed.), *Teaching collocation: Further developments in the lexical approach* (pp. 70–86). Language Teaching Publications.
- Council of Europe. (2001). *Common European framework of reference for languages: Learning, teaching, assessment*. Cambridge University Press.

- Council of Europe. (2018). *Common European framework of reference for languages: Learning, teaching, assessment: Companion volume with new descriptors*. Council of Europe. <https://rm.coe.int/common-european-framework-of-reference-for-languages-learning-teaching/16809ea0d4>
- Cowie, A. P. (1988). Stable and creative aspects of vocabulary use. In R. Carter & M.J. McCarthy (Eds.), *Vocabulary and language teaching* (pp. 126–139). Longman.
- Cowie, A. P. (1991). Multiword Units in Newspaper Language. In S. Granger (Ed.), *Perspectives on the English lexicon: A tribute to Jacques Van Roey* (pp. 101–116). Cahiers de l'Institut de Linguistique de Louvain.
- Cowie, A. P. (1992). Multiword lexical units and communicative language teaching. In P. Arnaud & H. Bejoint (Eds.), *Vocabulary and applied linguistics* (pp. 1–12). Macmillan.
- Cowie, A. P. (1994). Phraseology. In Asher, R.E. (Ed.). *The Encyclopedia of language and linguistics* (pp. 3168–3171). Oxford University Press.
- Cowie, A. P. (Ed.). (1998). *Phraseology: Theory, analysis, and applications*. Oxford University Press.
- Cowie, A. P. (2001). Speech formulae in English: problems of analysis and dictionary treatment. In G. van de Meer & A. G. B. ter Meulen (Eds.), *Making senses: From lexeme to discourse. In Honor of Werner Abraham* (pp.1-12) [Groninger Arbeiten zur germanistischen Linguistik,44]. Groningen: Center for Language and Cognition.
- Coxhead, A. (2000). A new academic word list. *TESOL Quarterly*, 34(2), 213–238. <https://doi.org/10.2307/3587951>
- Crandell, E. R. (2017). *Quizlet flashcards for the first 500 words of the academic vocabulary list* [Unpublished Masters' thesis]. Utah: Brigham Young University Brigham Young University Department of Linguistics and English Language. <https://scholarsarchive.byu.edu/etd/6335/>

- Crossley, S. A., Salsbury, T., & McNamara, D. S. (2015). Assessing lexical proficiency using analytic ratings: A case for collocation accuracy. *Applied Linguistics*, 36(5), 570–590. <https://doi.org/10.1093/applin/amt056>
- Cruse, D. A. (1986). *Lexical semantics*. Cambridge University Press.
- Dagut, M., & Laufer, B. (1985). Avoidance of phrasal verbs—A case for contrastive analysis. *Studies in Second Language Acquisition*, 7(1), 73–79. <https://doi.org/10.1017/S0272263100005167>
- Dang, C. N., & Dang, T. N. Y. (2023). The predictive validity of the IELTS test and contribution of IELTS preparation courses to international students' subsequent academic study: Insights from Vietnamese international students in the UK. *RELC Journal*, 54(1), 84–98. <https://doi.org/10.1177/0033688220985533>
- Dang, T. N. Y. (2017). *Investigating vocabulary in academic spoken English: Corpora, teachers, and learners* [Unpublished doctoral dissertation]. Victoria University, Wellington. https://openaccess.wgtn.ac.nz/articles/thesis/Investigating_vocabulary_in_academic_spoken_English_Corpora_teachers_and_learners/17060051
- Dang, T. N. Y. (2020). Corpus-based word lists in second language vocabulary research, learning, and teaching. In S. Webb (Ed.), *The Routledge handbook of vocabulary studies* (pp. 299–303). Routledge. <https://doi.org/10.4324/9780429291586-10>
- Dang, T. N. Y., & Webb, S. (2016). Evaluating lists of high-frequency words. *International Journal of Applied Linguistics*, 167(2), 132–158. <https://doi.org/10.1075/itl.167.2.02dan>
- Dang, T. N. Y., Coxhead, A., & Webb, S. (2017). The academic spoken word list. *Language Learning*, 67(4), 959–997. <https://doi.org/10.1111/lang.12253>
- Dashtestani, R. (2016). Moving bravely towards mobile learning: Iranian students' use of mobile devices for learning English as a foreign language. *Computer Assisted*

Language Learning, 29(4), 815–832.

<https://doi.org/10.1080/09588221.2015.1069360>

Dastmard, K., Gowhary, H., & Azizifar, A. (2016). Investigating patterns of reciprocal English-Persian translation of collocations by Iranian EFL learners. *Theory and Practice in Language Studies*, 6(11), 2140–2150.

<http://dx.doi.org/10.17507/tpls.0611.11>

David, A. (2008). A developmental perspective on productive lexical knowledge in L2 oral interlanguage1. *Journal of French Language Studies*, 18(3), 315–331.

<https://doi.org/10.1017/S0959269508003475>

Davies, M. (2008). *The corpus of contemporary American English: 425 million words, 1990-present*. Brigham Young University. <http://corpus.byu.edu/coca/>

Davis, P., & Kryszewska, H. (2012). *The company words keep: Lexical chunks in language teaching*. Delta Publishing.

Davoudi, M., & Behshad, A. (2015). Collocational use: A contrastive analysis of strategies used by Iranian EFL learners. *Theory and Practice in Language Studies*, 5(12),

2646–2652. <https://doi.org/10.17507/tpls.0512.29>

Dechert, H. W. (1983). How a story is done in a second language? In C. Faerch & G. Kasper (Eds.), *Strategies in interlanguage communication* (pp. 175–196). Longman.

Dechert, H. W., & Lennon, P. (1989). Collocational blends of advanced second language learners: A preliminary analysis. In W. Olesky (Ed.), *Contrastive pragmatic* (pp. 131–168). Benjamins.

Derakhshan, A., & Janebi Enayat, M. (2020). High-and mid-frequency vocabulary size as predictors of Iranian university EFL students' speaking performance. *Iranian Journal of English for Academic Purposes*, 9(3),1–13.

https://journalscmu.sinaweb.net/article_109848_14001.html

- Dictionary, M. W. (2002). Merriam-webster. <https://www.merriam-webster.com>
- Digital Volcano. (2011). *Textcrawler (Version 2.5)* [Computer Software].
<http://www.digitalvolcano.co.uk/content/textcrawler>
- Ding, C., & Reynolds, B. L. (2019). The effects of L1 congruency, L2 proficiency, and the collocate-node relationship on the processing of L2 English collocations by L1-Chinese EFL learners. *Review of Cognitive Linguistics, 17*(2), 331–357.
<https://doi.org/10.1075/rcl.00038.din>
- Dizon, G., & Tang, D. (2017). Comparing the efficacy of digital flashcards versus paper flashcards to improve receptive and productive L2 vocabulary. *The EuroCALL Review, 25*(1), 3–15. <https://doi.org/10.4995/eurocall.2017.6964>
- Dodigovic, M. (2013). Vocabulary learning with electronic flashcards: Teacher design vs. student design. *Voices in Asia Journal, 1*, 15–33.
- Donaldson, P. (2019). *Bootstrapping in SPSS v. 22 (Version 1)*. figshare.
<https://doi.org/10.6084/m9.figshare.9275909.v1>
- Doughty, C., & Williams, J. (1998). Pedagogical choices in focus on form. In C. Doughty & Williams (Eds.), *Focus on form in classroom second language acquisition* (pp. 197–262). CUP.
- Du, L., Elgort, I., & Siyanova-Chanturia, A. (2021). Cross-language influences in the processing of multiword expressions: From a first language to second and back. *Frontiers in Psychology, 12*, 666520–666520.
<https://doi.org/10.3389/fpsyg.2021.666520>
- Du, L., Elgort, I., & Siyanova-Chanturia, A. (2023). Cross-language influences in the processing of L2 multi-word expressions. In I. Elgort, A. Siyanova-Chanturia, A., & M. Brysbaert (Eds.), *Cross-language Influences in Bilingual Processing and Second*

- Language Acquisition* (pp. 187–210). John Benjamins.
<https://doi.org/10.1075/bpa.16.08du>
- Du, X., Afzaal, M., & AlFadda, H. (2022). Collocation uses in EFL learners' writing across multiple language proficiencies: A corpus-driven study. *Frontiers Psychology, 13*, 752134. <https://doi.org/10.3389/fpsyg.2022.752134>
- Durrant, P. (2009). Investigating the viability of a collocation list for students of English for academic purposes. *English for Specific Purposes, 28*(3), 157–169.
<https://doi.org/10.1016/j.esp.2009.02.002>
- Durrant, P. (2014a). Discipline and level specificity in university students' Written vocabulary. *Applied Linguistics, 35*(3), 328–356. <https://doi.org/10.1093/applin/amt016>
- Durrant, P. (2014b). Corpus frequency and second language learners' knowledge of collocations: A meta-analysis. *International Journal of Corpus Linguistics, 19*, 443–477. <https://doi.org/10.1075/ijcl.19.4.01dur>
- Durrant, P., & Schmitt, N. (2009). To what extent do native and non-native writers make use of collocations? *International Review of Applied Linguistics in Language Teaching, IRAL, 47*(2), 157–177. <https://doi.org/10.1515/iral.2009.007>
- Durrant, P., Siyanova-Chanturia, A., Kremmel, B., & Sonbul, S. (2022). *Research methods in vocabulary studies*. John Benjamins.
- Edge, D., Fitchett, S., Whitney, M., & Landay, J. (2012, September). MemReflex: adaptive flashcards for mobile microlearning. In *Proceedings of the 14th international conference on Human-computer interaction with mobile devices and services* (pp. 431–440).
- Ellis, N. (2002). Frequency effects in language processing: A review with implications for theories of implicit and explicit language acquisition. *Studies in Second Language Acquisition, 24*, 143–188. <https://doi.org/10.1017/S0272263102002024>

- Ellis, N. (2001). Memory for language. In P. Robinson (Ed.), *Cognition and second language instruction* (pp. 33–68). Cambridge University Press.
- Ellis, R. (1994). *The study of second language acquisition*. Oxford University Press.
- Ellis, R. (2008). *The study of second language acquisition* (2nd ed., Oxford applied linguistics). Oxford University Press.
- Ellis, R., & Barkhuizen, G. (2005). *Analyzing learner language*. Oxford University Press.
- Elyildirm, S. (1997). *The acquisition of collocation by Turkish EFL learners* [Unpublished doctoral dissertation]. University of Reading.
- Erman, B., & Warren, B. (2000). The idiom principle and the open choice principle. *Text-Interdisciplinary Journal for the Study of Discourse*, 20(1), 29–62.
<https://doi.org/10.1515/text.1.2000.20.1.29>
- Estaji, M., & Hashemi, M. (2022). Phraseological competence in IELTS academic writing task 2: phraseological units and test-takers perceptions and use. *Language Testing in Asia*, 12(1), 1–25. <https://doi.org/10.1186/s40468-022-00180-7>
- Evert, S. (2004). *The statistics of word co-occurrences: word pairs and collocations* [Unpublished doctoral dissertation]. Institut für maschinelle Sprachverarbeitung, University of Stuttgart.
- Eyckmans, J. (2009). Toward an assessment of learners' receptive and productive syntagmatic knowledge. In A. Barfield, & H. Gyllstad (Eds.), *Researching collocations in another language* (pp. 139–152). Palgrave Macmillan.
- Fahim, M., & Vaezi, R. (2011). Investigating the effect of visually-enhanced input on the acquisition of lexical collocations by Iranian intermediate EFL learners: A case of verb-noun lexical collocations. *Journal of Language Teaching and Research*, 2(3), 552–560. <https://doi.org/10.4304/jltr.2.3.552-560>

- Fan, M. (2009). An exploratory study of collocational use by ESL students – A task-based approach. *System (Linköping)*, 37(1), 110–123.
<https://doi.org/10.1016/j.system.2008.06.004>
- Fang, N., & Zhang, P. (2021). L1 congruency, word frequency, collocational frequency, L2 proficiency, and their combined effects on Chinese–English bilinguals' L2 collocational processing. *International Journal of Bilingualism*, 1–17.
<https://doi.org/10.1177/13670069211024747>
- Farghal, M., & Obeidat, H. (1995). Collocations: A neglected variable in EFL. *IRAL*, 33(4), 315–331. <https://doi.org/10.1515/iral.1995.33.4.315>
- Farvardin, M. T. (2019). Effects of spacing techniques on EFL learners' recognition and production of lexical collocations. *Indonesian Journal of Applied Linguistics*, 9(2), 395–403. <https://doi.org/10.17509/ijal.v9i2.20237>
- Fayez-Hussein, R. (1990). Collocations: The missing link in vocabulary acquisition amongst EFL learners. In J. Fisiak (Ed.), *Papers and studies in contrastive linguistic: The Polish English contrastive project*, 26 (pp. 123–126). Adam Mickiewicz University.
- Fellbaum, C. (2015). The treatment of multi-word units in lexicography. In P. Durkin (Ed.), *The Oxford handbook of lexicography* (pp. 411–424). Oxford University Press.
- Firth, J. R. (1957). *Papers in linguistics 1934–1951*. Oxford University Press.
- Foster, H. (2009). Building learner-generated vocabulary logs with Quizlet. *The Language Teacher*, 33(12), 23–25.
- Foster, P. (2001). Rules and routines: A consideration of their role in the task-based language production of native and non-native speakers. In M. Bygate, P. Skehan, & M. Swain (Eds.), *Researching pedagogic tasks: Second language learning. Teaching and testing* (pp. 75–93). Longman.

- Frankenberg-Garcia, A. (2018). Investigating the collocations available to EAP writers. *Journal of English for Academic Purposes*, 35, 93–104.
<https://doi.org/10.1016/j.jeap.2018.07.003>
- Frost, J. (2019). *Regression analysis: An intuitive guide for using and interpreting linear models*. Statistics by Jim Publishing.
- Gablasova, D., Brezina, V., & McEnery, T. (2017). Collocations in corpus-based language learning research: Identifying, comparing, and interpreting the evidence. *Language Learning*, 67, 1551–79. <https://doi.org/10.1111/lang.12225>
- Gagen, T., & Faez, F. (2023). The predictive validity of IELTS scores: a meta-analysis. *Higher Education Research and Development*, 1–16.
<https://doi.org/10.1080/07294360.2023.2280700>
- Gardner, D., & Davies, M. (2014). A new academic vocabulary list. *Applied Linguistics*, 35(3), 305–327. <https://doi.org/10.1093/applin/amt015>
- Garnier, M., & Schmitt, N. (2015). The PHaVE List: A pedagogical list of phrasal verbs and their most frequent meaning senses. *Language Teaching Research*, 19, 645–666.
<https://doi.org/10.1177/1362168814559798>
- Gitsaki, C. (1996). *The development of ESL collocational knowledge* [Unpublished doctoral dissertation]. University of Queensland.
- Godwin-Jones, R. (2010). From memory palaces to spacing algorithms: Approaches to second-language vocabulary learning [Emerging technologies]. *Language Learning & Technology*, 14(2), 4–11. <http://dx.doi.org/10125/44208>
- González Fernández, B., & Schmitt, N. (2015). How much collocation knowledge do L2 learners have? The effects of frequency and amount of exposure. *ITL International Journal of Applied Linguistics*, 166, 94–126. <https://doi.org/10.1075/itl.166.1.03fer>

- González Fernández, B., & Schmitt, N. (2019). Word knowledge: Exploring the relationships and order of acquisition of vocabulary knowledge components. *Applied Linguistics*, 41(4), 481–505. <https://doi.org/10.1093/applin/amy057>
- Goto, K. (2005). *GoTagger (Version 0.7)* [Computer Software].
<http://web4u.setsunan.ac.jp/Website/GoTagger.htm#>
- Goulden, R., Nation, P., & Read, J. (1990). How large can a receptive vocabulary be? *Applied Linguistics*, 11(4), 341–363. <https://doi.org/10.1093/applin/11.4.341>
- Granger, S. (1998). Prefabricated patterns in advanced EFL writing: Collocations and formulae. In A. P. Cowie (Ed.), *Phraseology, theory, analysis and applications* (pp. 145–160). Oxford University Press.
- Granger, S. (2002). A bird's eye view of learner corpus research. In S. Granger, J. Hung, & S. Petch-Tyson (Eds.), *Computer learner corpora, second language acquisition and foreign language teaching* (pp. 3–33). John Benjamins.
- Granger, S., & Bestgen, Y. (2014). The use of collocations by intermediate vs. advanced non-native writers: A bigram-based study. *International Review of Applied Linguistics in Language Teaching*, 52(3), 229–252. <https://doi.org/10.1515/iral-2014-0011>
- Granger, S., & Paquot, M. (2008). Disentangling the phraseological web. In S. Granger & F. Meunier (Eds.), *Phraseology: An interdisciplinary perspective* (pp. 27–49). John Benjamins.
- Grant, L. (2005). Frequency of core idioms in the British National Corpus (BNC). *International Journal of Corpus Linguistics*, 10(4), 429–451.
<https://doi.org/10.1075/ijcl.10.4.03gra>
- Grant, L., & Bauer, L. (2004). Criteria for re-defining idioms: Are we barking up the wrong tree? *Applied Linguistics*, 25(1), 38–61. <https://doi.org/10.1093/applin/25.1.38>

- Grant, L., & Nation, P. (2006). How many idioms are there in English? *International Journal of Applied Linguistics*, 151,1–14. <https://doi.org/10.2143/itl.151.0.2015219>
- Greaves, C. (2005, June). Introduction to ConcGram©. In *Tuscan Word Centre International Workshop. Certosa di Pontignano, Tuscany, Italy* (pp. 25–29).
- Green, C., & Lambert, J. (2018). Advancing disciplinary literacy through English for academic purposes: Discipline-specific wordlists, collocations and word families for eight secondary subjects. *Journal of English for Academic Purposes*, 35, 105–115. <https://doi.org/10.1016/j.jeap.2018.07.004>
- Gyllstad, H. (2005). Words that go together well: developing test formats for measuring learner knowledge of English collocations. *International Journal of English Studies* 7(2), 127–157. <https://lucris.lub.lu.se/ws/files/5346153/625034.pdf>
- Gyllstad, H. (2009). Designing and evaluating tests of receptive collocation knowledge: COLLEX and COLLOMATCH. In A. Barfield & H. Gyllstad (Eds.), *Researching collocations in another language: Multiple interpretations* (pp. 153–170). Palgrave Macmillan.
- Gyllstad, H. (2020). Measuring knowledge of multiword items. In S. Webb (Ed.), *The Routledge handbook of vocabulary studies* (pp. 387–405). Routledge.
- Gyllstad, H., & Schmitt, N. (2018). Testing formulaic language. In A. Siyanova-Chanturia & A. Pellicer-Sánchez (Eds.), *Understanding formulaic language: A second language acquisition perspective* (pp. 174–191). Routledge.
- Gyllstad, H., & Wolter, B. (2016). Collocational processing in light of the phraseological continuum model: Does semantic transparency matter? *Language Learning*, 66(2), 296–323. <https://doi.org/10.1111/lang.12143>

- Gyllstad, H., Vilkaitė, L., & Schmitt, N. (2015). Assessing vocabulary size through multiple-choice formats: Issues with guessing and sampling rates. *ITL International Journal of Applied Linguistics*, 166, 276–303. <https://doi.org/10.1075/itl.166.2.04gyl>
- Haghighi, H., & Hemmati, F. (2018). A multifaceted approach to the translation of collocations from English to Persian. *Applied Linguistics Research Journal*, 2(2), 8–25.
- Haukoos, J. S., & Lewis, R. J. (2005). Advanced statistics: bootstrapping confidence intervals for statistics with “difficult” distributions. *Academic emergency medicine*, 12(4), 360–365. <https://doi.org/10.1197/j.aem.2004.11.018>
- Henriksen, B. (2013). Research on L2 learners’ collocational competence and development—A progress report. In C. Bardel, C. Lindqvist, & B. Laufer (Eds.), *L2 vocabulary acquisition, knowledge and use—New perspectives on assessment and corpus analysis* (pp. 29–56). Eurosla
- Herbst, T. (1996). What are collocations: Sandy beaches or false teeth? *English Studies*, 77(4), 379–393. <https://doi.org/10.1080/00138389608599038>
- Hill, J. (2000). Revising priorities: from grammatical failure to collocational success. In M. Lewis (Ed.), *Teaching collocation: Further developments in the lexical approach* (pp. 47–67). Language Teaching Publications.
- Hirschel, R., & Fritz, E. (2013). Learning vocabulary: CALL program versus vocabulary notebook. *System*, 41(3), 639–653. <https://doi.org/10.1016/j.system.2013.07.016>
- Hoey, M. (2005). *Lexical priming: A new theory of words and language* (1st ed.). Routledge. <https://doi.org/10.4324/9780203327630>
- Howarth, P. (1996). *Phraseology in English academic writing: Some implications for language learning and dictionary making*. Niemeyer.

- Howarth, P. (1998). Phraseology and second language proficiency. *Applied linguistics*, 19(1), 24–44. <https://doi.org/10.1093/applin/19.1.24>
- Huang, L. S. (黃俐絲, 2001). Knowledge of English collocations: An analysis of Taiwanese EFL learners. *Texas papers in foreign language education: Selected proceedings from the Texas foreign language education conference 2001*, 6(1), 113–129. (ERIC Document Reproduction Service No. 465 288).
<https://files.eric.ed.gov/fulltext/ED465288.pdf>
- Hung, H. (2015). Intentional vocabulary learning using digital flashcards. *English Language Teaching (Toronto)*, 8(10), 107. <https://doi.org/10.5539/elt.v8n10p107>
- Hunston, S. (2002). *Corpora in applied linguistics*. Cambridge University Press.
- Hunston, S., & Francis, G. (2000). *Pattern grammar. A corpus-driven approach to the lexical grammar of English*. John Benjamins Publishing.
- Jackendoff, R. (1997). 'Twistin' the Night away. *Language*, 73, 534–559.
<https://doi.org/10.2307/415883>
- Jaén, M. M. (2007). A corpus-driven design of a test for assessing the ESL collocational competence of university students. *International journal of English studies*, 7(2), 127–148. <https://revistas.um.es/ijes/article/view/49031>
- Jarvis, S., & Pavlenko, A. (2008). *Crosslinguistic influence in language and cognition*. Routledge.
- Jiang, N. A., & Nekrasova, T. M. (2007). The processing of formulaic sequences by second language speakers. *The Modern Language Journal*, 91(3), 433–445.
<https://doi.org/10.1111/j.1540-4781.2007.00589.x>
- Jolsavi, H., McCauley, S. M., & Christiansen, M. H. (2013). Meaning overrides frequency in idiomatic and compositional multiword chunks. In *Proceedings of the Annual Meeting of the Cognitive Science Society* (Vol. 35, No. 35, 692–697).

- Joyce, P. (2018). L2 vocabulary learning and testing: The use of L1 translation versus L2 definition. *The Language Learning Journal*, 46(3), 217–227.
<https://doi.org/10.1080/09571736.2015.1028088>
- Kasahara, K. (2010). Are two words better than one for intentional vocabulary learning? *Annual Review of English Language Education in Japan*, 21, 91–100.
https://doi.org/10.20581/arele.21.0_91
- Kasahara, K. (2011). The effect of known-and-unknown word combinations on intentional vocabulary learning. *System*, 39, 491–499.
<https://doi.org/10.1016/j.system.2011.10.001>
- Keshavarz, M. H. (2011). *Contrastive Analysis and Error Analysis*. Rahnama Press.
- Keshavarz, M. H., & Salimi, H. (2007). Collocational competence and cloze test performance: A study of Iranian EFL learners. *International Journal of Applied Linguistics*, 17, 81–92.
- Kilgarriff, A., Marcowitz, F., Smith, S., & Thomas, J. (2015). Corpora and Language Learning with the Sketch Engine and SKELL. *Revue française de linguistique appliquée*, XX, 61–80. <https://doi.org/10.3917/rfla.201.0061>
- Kivunja, C., & Kuyini, A. B. (2017). Understanding and applying research paradigms in educational contexts. *International Journal of Higher Education*, 6(5), 26–41.
<https://doi.org/10.5430/ijhe.v6n5p26>
- Kjellmer, G. (1987). Aspects of English collocations. In W. Meijs (Ed.), *Corpus linguistics and beyond: Proceedings of the seventh international conference on English language research on computerized corpora* (pp. 133–140). Rodopi.
- Kjellmer, G. (1994). *A dictionary of English collocations: Based on the Brown corpus*. Claredon Press.

- Kleinmann, H. H. (1978). The strategy of avoidance in adult second language acquisition. In W. C. Ritchie (Ed.), *Second language acquisition research: Issues and implications* (pp. 157–174). Academic Press.
- Koosha, M., & Jafarpour, A. A. (2006). Data-driven learning and teaching collocation of prepositions: The case of Iranian EFL adult learners. *Asian EFL Journal*, 8(4), 192–209. Retrieved from: file:///C:/Users/mbarg/Downloads/December_2006_EBook.pdf
- Koprowski, M. (2005). Investigating the usefulness of lexical phrases in contemporary coursebooks. *ELT Journal*, 59(4), 322–332. <https://doi.org/10.1093/elt/cci061>
- Koval, N. G. (2019). Testing the deficient processing account of the spacing effect in second language vocabulary learning: Evidence from eye tracking. *Applied Psycholinguistics*, 40(5), 1103–1139. <https://doi.org/10.1017/S0142716419000158>
- Koya, T. (2004). Collocation research based on corpora collected from secondary school textbooks in Japan and in the UK. *Dialogue*, 3, 7–18. Retrieved from: https://www.talk-waseda.net/dialogue/no03_2004/2004dialogue03_k1.pdf
- Kremmel, B. (2016). Word families and frequency bands in vocabulary tests: Challenging conventions. *TESOL Quarterly*, 50(4), 976–987. <https://doi.org/10.1002/tesq.329>
- Lado, R. (1957). *Linguistics across cultures: Applied linguistics and language teachers*. University of Michigan Press.
- Laerd Statistics (2015). *Statistical tutorials and software guides*. <https://statistics.laerd.com/>
- Larsen-Freeman, D., & Anderson, M. (2013). *Techniques and principles in language teaching (3rd ed.)*. Oxford university press.
- Laufer, B., & Eliasson, S. (1993). What causes avoidance in L2 learning: L1 - L2 difference, L1 - L2 similarity, or L2 complexity? *Studies in Second Language Acquisition*, 15(1), 35–48. <https://doi.org/10.1017/S0272263100011657>

- Laufer, B., & Girsai, N. (2008). Form-focused instruction in second language vocabulary learning: A case for contrastive analysis and translation. *Applied Linguistics*, 29(4), 694–716. <https://doi.org/10.1093/applin/amn018>
- Laufer, B., & Nation, I. S. P. (1999). A vocabulary-size test of controlled productive ability. *Language Testing*, 16(1), 33–55. <https://doi.org/10.1191/026553299672614616>
- Laufer, B., & Ravenhorst-Kalovski, G. C. (2010). Lexical threshold revisited: Lexical text coverage, learners' vocabulary size and reading comprehension. *Reading in a Foreign Language*, 22(1), 15–30. <http://hdl.handle.net/10125/66648>
- Laufer, B., & Waldman, T. (2011). Verb-noun collocations in second language writing: A corpus analysis of learners' English. *Language Learning*, 61(2), 647–672. <https://doi.org/10.1111/j.1467-9922.2010.00621.x>
- LDOCE Online (n.d.). *Longman dictionary*. <https://www.ldoceonline.com/about.html>
- Lee, S. (2015). Korean EFL learners' productive collocation knowledge and its relationship to their writing proficiency. *English Language and Literature Teaching* 21(4), 59–84. Retrieved from: <https://scholar.kyobobook.co.kr/article/detail/4010024787809>
- Lei, L., & Liu, D. (2018). The academic English collocation list. A corpus driven study. *International Journal of Corpus Linguistics*, 23, 216–243. <https://doi.org/10.1075/ijcl.16135.lei>
- Leitner, S. (1972). *So lernt man lernen. Angewandte Lernpsychologie – ein Weg zum Erfolg*. Verlag Herder. <https://ixtheo.de/Record/118953621>
- Leitner system. (2021, April 5). In *Wikipedia*. https://en.wikipedia.org/wiki/Leitner_system#References
- Lennon, P. (1996). Getting “easy” verbs wrong at the advanced level. *International Review of Applied Linguistics*, 34, 23–36. <https://doi.org/10.1515/iral.1996.34.1.23>

- Leśniewska, J., & Witalisz, E. (2007). Cross-linguistic influence and acceptability judgments of L2 and L1 collocations: A study of advanced Polish learners of English. *Eurosla Yearbook*, 7(1), 27–48. <https://doi.org/10.1075/eurosla.7.04les>
- Lewis, M. (1993). *The lexical approach: The state of ELT and a way forward*. Language Teaching Publications.
- Lewis, M. (2000). Language in the lexical approach. In M. Lewis (Ed), *Teaching collocation: Further developments in the lexical approach* (pp. 155–184). Language Teaching Publications.
- Li, J. T., & Tong, F. (2019). Multimedia-assisted self-learning materials: the benefits of E-flashcards for vocabulary learning in Chinese as a foreign language. *Reading and Writing*, 32(5), 1175–1195. <https://doi.org/10.1007/s11145-018-9906-x>
- Li, P., & Lan, Y. (2021). Digital language learning (DLL): Insights from behaviour, cognition, and the brain. *Bilingualism: Language and Cognition*, 25(3), 361-378. <https://doi.org/10.1017/S1366728921000353>
- Lin, W., Hsiao-Ching, Y., & Ho-Ping, F. (2003). English vocabulary knowledge of first-year university students: Vocabulary size and collocational knowledge. In *The Proceedings of the 2003 Conference and Workshop on FEFL and Applied Linguistics* (pp. 202–213). Crane Publishing Co.
- Lindstromberg, S. (2020). Intentional L2 vocabulary learning. In S. Webb (Ed.), *The Routledge handbook of vocabulary studies* (pp. 240–254). Routledge. <https://doi.org/10.4324/9780429291586-10>
- Lindstromberg, S., & Boers, F. (2008). The mnemonic effect of noticing alliteration in lexical chunks. *Applied Linguistics*, 29(2), 200–222. <https://doi.org/10.1093/applin/amn007>

- Lindstromberg, S., Eyckmans, J., & Connabeer, R. (2016). A modified dictogloss for helping learners remember L2 academic English formulaic sequences for use in later writing. *English for Specific Purposes*, 41, 12–21. <https://doi.org/10.1016/j.esp.2015.08.002>
- Liu, E. T., & Shaw, P. M. (2001). Investigating learner vocabulary: A possible approach to looking at EFL/ESL learners' qualitative knowledge of the word. *International Review of Applied Linguistics in Language Teaching*, 39(3), 171–194. <https://doi.org/10.1515/iral.2001.001>
- Liu, S., Liu, H., Yu, Y., Li, Y., & Wen, T. (2014). TPACK: A new dimension to EFL teachers' PCK. *Journal of Education and Human Development*, 3(2), 681–693. <https://citeseerx.ist.psu.edu/document?repid=rep1&type=pdf&doi=bd0d825b7654f8101b9d1c653a70f8593cbd50e9>
- Llach, M. P. (2011). *Lexical errors and accuracy in foreign language writing*. Multilingual Matters.
- Love, R., Dembry, C., Hardie, A., Brezina, V., & McEnery, T. (2017). The spoken BNC2014: Designing and building a spoken corpus of everyday conversations. *International Journal of Corpus Linguistics*, 22(3), 319–344. <https://doi.org/10.1075/ijcl.22.3.02lov>
- Matthews, P. H. (2014). *The concise Oxford dictionary of linguistics*. Oxford University Press.
- Macis, M., & Schmitt, N. (2017a). Not just 'small potatoes': Knowledge of the idiomatic meanings of collocations. *Language Teaching Research: LTR*, 21(3), 321–340. <https://doi.org/10.1177/1362168816645957>
- Macis, M., & Schmitt, N. (2017b). The figurative and polysemous nature of collocations and their place in ELT. *ELT Journal*, 71, 50–59. <https://dolorgho.1093/elt/ccwo44>

- Macis, M., Sonbul, S., & Alharbi, R. (2021). The effect of spacing on incidental and deliberate learning of L2 collocations. *System*, 103, 102649.
<https://doi.org/10.1016/j.system.2021.102649>
- Mackenzie, N., & Knipe, S. (2006). Research dilemmas: paradigms, methods and methodology. *Issues in Educational Research*, 16, 1–15.
<https://www.iier.org.au/iier16/mackenzie.html>
- Mackin, R. (1978). On collocations: Words shall be known by the company they keep. In P. Strevens (Ed.), *In honour of A.S. Hornby* (pp. 149–165). Oxford University Press.
- Majuddin, E., Siyanova-Chanturia, A., & Boers, F. (2021). Incidental acquisition of multiword expressions through audiovisual materials: The role of repetition and typographic enhancement. *Studies in Second Language Acquisition*, 43(5), 985–1008.
<https://doi.org/10.1017/S0272263121000036>
- Manning, C., & Schütze, H. (1999). *Foundations of statistical natural language processing*. MIT Press.
- Marsden, E., Morgan-Short, K., Trofimovich, P., & Ellis, N. C. (2018). Introducing registered reports at language learning: Promoting transparency, replication, and a synthetic ethic in the language sciences. *Language Learning*, 68(2), 309–320.
<https://doi.org/10.1111/lang.12284>
- Martelli, A. (2006, September). A corpus-based description of English lexical collocations used by Italian advanced learners. In *Atti del XII Congresso Internazionale di Lessicografia* (pp. 1005–1011).
- Martinez, R. (2011, September). Putting a test of multiword expressions to a test. In *IATEFL Testing, Evaluation and Assessment Conference (TEA SIG)*, University of Innsbruck.
- Martinez, R. (2013). A framework for the inclusion of multi-word expressions in ELT. *ELT Journal*, 67(2), 184–198. <https://doi.org/10.1093/elt/ccs100>

- Martinez, R., & Murphy, V. (2011). Effect of frequency and idiomaticity on second language reading comprehension. *TESOL Quarterly*, 45(2), 267–290.
<https://doi.org/10.5054/tq.2011.247708>
- Martinez, R., & Schmitt, N. (2012). A phrasal expressions list. *Applied Linguistics*, 33(3), 299–320. <https://doi.org/10.1093/applin/ams010>
- Marton, W. (1977). Foreign vocabulary learning as problem no. 1 of language teaching at the advanced level. *Interlanguage Studies Bulletin*, 2(1), 33–57.
<http://www.jstor.org/stable/43135158>.
- Masini, F. (2019). Multi-Word Expressions and Morphology. In *Oxford Research Encyclopedia of Linguistics*. Oxford University Press.
<https://doi.org/10.1093/acrefore/9780199384655.013.611>
- Maxwell, S. E., & Delaney, H. D. (2004). *Designing experiments and analysing data: A model comparison perspective* (2nd ed.). Psychology Press.
- McCarthy, M., & O'Dell, F. (2005). *English collocations in use: How words work together for fluent and natural English; self-study and classroom use*. Cambridge University Press.
- McClelland, J. L. (2010). Emergence in cognitive science. *Topics in Cognitive Science*, 2(4), 751–770. <https://doi.org/10.1111/tops.12258>
- McIntosh, C., Francis, B., & Poole, R. (2009). *Oxford collocations dictionary for students of English* (2nd ed.). Oxford University Press.
- Men, H. (2018). *Vocabulary increase and collocation learning: A corpus-based cross-sectional study of Chinese learners of English*. Springer Singapore Pte. Limited.
<https://link.springer.com/book/10.1007/978-981-10-5822-6>
- Mertens, D. M. (2005). *Research methods in education and psychology: Integrating diversity with quantitative and qualitative approaches*. Sage Publications.

- Meunier, F. (2012). Formulaic language and language teaching. *Annual Review of Applied Linguistics*, 32, 111–129. <https://doi.org/10.1017/S0267190512000128>
- Millar, N. (2011). The processing of malformed formulaic language. *Applied linguistics*, 32(2), 129–148. <https://doi.org/10.1093/applin/amq035>
- Miralpeix, I. (2020). L1 and L2 vocabulary size and growth. In S. Webb (Ed.), *The Routledge handbook of vocabulary students* (pp. 189-206). Routledge.
<https://doi.org/10.4324/9780429291586-10>
- Miralpeix, I., & Muñoz, C. (2018). Receptive vocabulary size and its relationship to EFL language skills. *International Review of Applied Linguistics in Language Teaching*, 56(1), 1–24. <https://doi.org/10.1515/iral-2017-0016>
- Mirzaei, S. (2022). *Improving Persian-English vocabulary learning through a learning strategy instruction embedded in a purpose-built web application* [Unpublished doctoral dissertation]. Flinders University.
<https://theses.flinders.edu.au/view/6a63c08f-a495-4f54-bd37-dd25dd6fac14/1>
- Miyakoshi, T. (2009). *Investigating ESL learners' lexical collocations: The acquisition of verb + noun collocations by Japanese learners of English* [Unpublished doctoral dissertation]. University of Hawai'i at Manoa. ProQuest Dissertations and Theses Global.
- Mohammadi, V., & Mohit, N. (2021). Student and teacher attitude toward using concordancing in learning and teaching preposition collocations: Issues and options. *Journal of Language Horizons*, 5(2), 139–166.
- Molavi, A., Koosha, M., & Hosseini, H. (2014). A comparative corpus-based analysis of lexical collocations used in EFL textbooks. *Latin American Journal of Content and Language Integrated Learning*, 7(1), 66-81. <https://doi.org/10.5294/laclil.2014.7.1.4>
eISSN 2322-9721

- Moon, R. (1994). The analysis of fixed expressions in text. In M. Coulthard (Ed.), *Advances in written text analysis*, (pp. 117–135). Routledge.
- Moon, R. (1997). Vocabulary connections: Multi-word items in English. In N. Schmitt & M. McCarthy, M. (Eds.). *Vocabulary. description, acquisition and pedagogy* (pp. 40–63). CUP.
- Moon, R. (1998). *Fixed expressions and idioms in English: a corpus-based approach*. Oxford University Press.
- Morino, A., Lopez, E., & Ono, Y. (2017, March). Effects of a digital storytelling project on Japanese EFL learners' CALL attitudes and awareness of CALL tasks. In *Society for Information Technology & Teacher Education International Conference* (pp. 367–373). Association for the Advancement of Computing in Education (AACE).
- Mubarak, R., & Smith, D. C. (2008). Spacing effect and mnemonic strategies: a theory-based approach to E-Learning. *MCCSIS'08 -IADIS Multi-Conference on Computer Science and Information Systems; Proceedings of e-Learning 2008, 2*, 269–272.
- Müller, A. & Han, W. (2022). IELTS Writing band scores 5.5–7.5: Grammatical error rates, stakeholder perceptions, and risk. *IELTS Research Reports Online Series, No. 1/22*. British Council, Cambridge Assessment English and IDP: IELTS Australia.
<https://www.ielts.org/teaching-and-research/research-reports>
- Nakata, T. (2006). English collocation learning through meaning-focused and form-focused activities: Interactions of activity types and L1 - L2 congruence. In *Proceedings of the 11th Conference of Pan-Pacific Association of Applied Linguistics* (pp. 154–168).
- Nakata, T. (2008). English vocabulary learning with word lists, word cards and computers: Implications from cognitive psychology research for optimal spaced learning. *ReCALL*, 20(1), 3–20. <https://doi.org/10.1017/S0958344008000219>

- Nakata, T. (2011). Computer-assisted second language vocabulary learning in a paired-associate paradigm: A critical investigation of flashcard software. *Computer Assisted Language Learning*, 24(1), 17–38. <https://doi.org/10.1080/09588221.2010.520675>
- Nakata, T. (2020). Learning words with flash cards and word cards. In S. Webb (Ed), *The Routledge handbook of vocabulary studies* (pp. 304–319). Routledge.
<https://doi.org/10.4324/9780429291586-20>
- Nakata, T., & Elgort, I. (2020). Effects of spacing on contextual vocabulary learning: Spacing facilitates the acquisition of explicit, but not tacit, vocabulary knowledge. *Second Language Research*, 37(2), 1–28. <https://doi.org/10.1177/0267658320927764>
- Nation, I. S. P. (1990). *Teaching and learning vocabulary*. Newbury House.
- Nation, I. S. P. (2001). *Learning vocabulary in another language* (1st ed.). Cambridge University Press.
- Nation, I. S. P. (2012). *The BNC/COCA word family lists*.
https://www.wgtn.ac.nz/__data/assets/pdf_file/0004/1689349/Information-on-the-BNC_COCA-word-family-lists-20180705.pdf
- Nation, I. S. P. (2013). *Learning vocabulary in another language* (2nd ed.). Cambridge University Press.
- Nation, I. S. P. (2016). *Making and using word lists for language learning and testing*. John Benjamins.
- Nation, I. S. P. (2020). The different aspects of vocabulary knowledge. In Webb, S. (Ed) *The Routledge handbook of vocabulary studies* (pp. 15–29). Routledge.
<https://doi.org/10.4324/9780429291586-10>
- Nation, I. S. P. (2022). *Learning Vocabulary in Another Language* (2nd ed.). Cambridge University Press.

- Nation, I. S. P., & Meara, P. (2002). Vocabulary. In N. Schmitt (Ed.) *An introduction to applied linguistics* (pp. 35–54). Edward Arnold.
- Nation, I. S. P., & Webb, S. (2011). *Researching and analysing vocabulary*. Heinle Cengage Learning.
- Nesselhauf, N. (2003). The use of collocations by advanced learners of English and some implications for teaching. *Applied Linguistics*, 24(2), 223–242.
<https://doi.org/10.1093/applin/24.2.223>
- Nesselhauf, N. (2004). What are collocations? In D. Allerton, N. Nesselhauf, & P. Skandera (Eds.), *Phraseological units: Basic concepts and their application* (pp. 1–21). Schwabe.
- Nesselhauf, N. (2005). *Collocations in a learner corpus*. John Benjamins Publishing Company.
- Nesselhauf, N., & Tshichold, C. (2002). Collocations in CALL: An investigation of vocabulary-building software for EFL. *Computer Assisted Language Learning*, 15(3), 251–279. <https://doi.org/10.1076/call.15.3.251.8190>
- Nguyen, T. M. H., & Webb, S. (2017). Examining second language receptive knowledge of collocation and factors that affect learning. *Language Teaching Research*, 21, 298–320. <https://doi.org/10.1177/13621688166396>
- Nikoopour, J., & Kazemi, A. (2014). Vocabulary learning through digitized & non-digitized flashcards delivery. *Procedia, Social and Behavioral Sciences*, 98, 1366–1373.
<https://doi.org/10.1016/j.sbspro.2014.03.554>
- Nizonkiza, D. (2012). Quantifying controlled productive knowledge of collocations across proficiency and word frequency levels. *Studies in Second Language Learning and Teaching*, 2(1), 67–92. <https://doi.org/10.14746/ssllt.2012.2.1.4>

- Nizonkiza, D. (2015). Measuring receptive collocational competence across proficiency levels. *Stellenbosch Papers in Linguistics*, 44, 125–146. <https://doi.org/10.5774/44-0-186>
- O'Dell, F., & McCarthy, M. (2008). *English Collocations in Use: Advanced*. Cambridge University Press.
- Öksüz, D., Brezina, V., & Rebuschat, P. (2021). Collocational processing in L1 and L2: The effects of word frequency, collocational frequency, and association. *Language Learning*, 71(1), 55–98. <https://doi.org/10.1111/lang.12427>
- Omar, Y. Z. (2019). Influence of grammar translation method (GTM) on Libyan students' English performance in communicative situations. *PEOPLE: International Journal of Social Sciences*, 5(2), 511–530. <https://doi.org/10.20319/pijss.2019.52.511530>
- Özdem-Ertürk, Z. (2021). *Factors affecting and productive knowledge of collocations of tertiary level learners of English in Turkey* [Doctoral dissertation, University of Hacettepe]. <https://openaccess.hacettepe.edu.tr/xmlui/handle/11655/25277>
- Palmer, H. E. (1933). *Second interim report on English collocations*. Kaitakusha.
- Paquot, M. (2018). Phraseological competence: A missing component in university entrance language tests? Insights from a study of EFL learners' use of statistical collocations. *Language Assessment Quarterly*, 15(1), 29–43. <https://doi.org/10.1080/15434303.2017.1405421>
- Pawley, A., & Syder, F. (1983). Two puzzles for linguistic theory. In J. Richards & R. Schmidt (Eds.), *Language and communication* (pp. 191–226). Longman.
- Pearce, D. (2001). Synonymy in collocation extraction. In *Proceedings of the workshop on WordNet and other lexical resources, second meeting of the North American chapter of the association for computational linguistics* (pp. 41–46). Pittsburgh, USA.

- Pearce, D. (2002). A comparative evaluation of collocation extraction techniques. In *LREC*, (pp. 1530–1536).
- Pellicer-Sánchez, A. (2015). Developing automaticity and speed of lexical access: The effects of incidental and explicit teaching approaches. *Journal of Spanish Language Teaching*, 2(2), 112–126. <https://doi.org/10.1080/23247797.2015.1104029>
- Pellicer-Sánchez, A. (2017). Learning L2 collocations incidentally from reading. *Language Teaching Research: LTR*, 21(3), 381–402. <https://doi.org/10.1177/1362168815618428>
- Pellicer-Sánchez, A. (2020). Learning single words vs. multiword items. In S. Webb (Ed.), *The Routledge handbook of vocabulary students* (pp. 158–173). Routledge. <https://doi.org/10.4324/9780429291586>
- Pérez Serrano, M. (2018). Which type of instruction fosters chunk learning? Preliminary conclusions. *Revista de Lingüística y Lenguas Aplicadas*, 13(1), 133–143. <https://doi.org/10.4995/rlyla.2018.7886>
- Peters, E. (2009). Learning collocations through attention-drawing techniques: A qualitative and quantitative analysis. In A. Barfield & H. Gyllstad (Eds.), *Researching collocations in another language: Multiple interpretations* (pp. 194–207). Palgrave Macmillan.
- Peters, E. (2012). Learning German formulaic sequences: The effect of two attention-drawing techniques. *The Language Learning Journal*, 40(1), 65–79. <https://doi.org/10.1080/09571736.2012.658224>
- Peters, E. (2014). The effects of repetition and time of post-test administration on EFL learners' form recall of single words and collocations. *Language Teaching Research: LTR*, 18(1), 75–94. <https://doi.org/10.1177/1362168813505384>

- Peters, E. (2016). The learning burden of collocations: The role of interlexical and intralexical factors. *Language Teaching Research*, 20(1), 113–138.
<https://doi.org/10.1177/1362168814568131>
- Peters, E. (2020). Factors affecting the learning of single-word items. In S. Webb (Ed.), *The Routledge handbook of vocabulary knowledge* (pp. 125–142). Routledge.
<https://doi.org/10.4324/9780429291586>
- Phoocharoensil, S. (2011). Collocational errors in EFL learners' interlanguage. *Journal of Education and Practice*, 2(3), 103–120.
- Piantadosi, S. T. (2014). Zipf's word frequency law in natural language: A critical review and future directions. *Psychonomic Bulletin & Review*, 21(5), 1112–1130.
<https://doi.org/10.3758/s13423-014-0585-6>
- Polit, D. F., Beck, C. T., & Hungler, B. P. (2001). *Essentials of nursing research, methods, appraisal and utilization* (5th ed.). Lippincott Williams & Wilkins.
- Porte, G., & McManus, k. (2019). *Doing replication research in applied linguistics*. Routledge.
- Qian, D. D., & Lin, L. H. F. (2020). The Relationship between vocabulary knowledge and language proficiency. In Webb, S. (Ed), *The Routledge handbook of vocabulary studies* (pp. 66–80). Routledge. <https://doi.org/10.4324/9780429291586-5>
- Ramisch, C., Villavicencio, A., & Kordoni, V. (2013). Introduction to the special issue on multiword expressions: From theory to practice and use. *ACM Transactions on Speech and Language Processing (TSLP)*, 10(2), 1–10. <https://doi.org/10.1145/2483691.2483692>
- Read, J. (1993). The development of a new measure of L2 vocabulary knowledge. *Language Testing*, 10, 355–371. <https://doi.org/10.1177/026553229301000308>

- Renouf, A., & Sinclair, J. (1991). Collocational frameworks in English. In K. Aijmer & B. Altenberg (Eds.), *English corpus linguistics* (pp. 128–143). Longman.
- Revier, R. L. (2009). Evaluating a new test of whole English collocations. In A. Barfield & H. Gyllstad (Eds.), *Researching collocations in another language: Multiple interpretations* (pp. 125–138). Palgrave Macmillan.
- Ringbom, H. (1998). Vocabulary frequencies in advanced learner English: A cross-linguistic approach. In S. Granger (Ed.), *Learner English on computer* (pp. 41–52). Longman
- Rogers, J. (2013). How many high-frequency words of English do Japanese university freshmen 'know'? *Kansai Gaikokugo University Journal of Inquiry and Research*, 97, 237–252. <https://kansaigaidai.repo.nii.ac.jp/records/6105>
- Rogers, J. (2014). An investigation into the viability of flashcard applications to aid language learning. *Higher Education Research*, 4, 7–20.
- Rogers, J. (2017a). *What are the collocational exemplars of high-frequency English vocabulary? On identifying MWUs most representative of high-frequency lemmatized concgrams* [Doctoral dissertation, University of Southern Queensland]. <https://research.usq.edu.au/item/q45qz/what-are-the-collocational-exemplars-of-high-frequency-english-vocabulary-on-identifying-mwus-most-representative-of-high-frequency-lemmatized-concgrams>
- Rogers, J. (2017b). On the implementation of a smartphone-based English app study program. *The Proceedings for the First International Forum* (pp. 71–76). Nagoya: Faculty of Foreign Studies, Meijo University.
- Rogers, J. M. (2018). Teaching collocations. In J. I. Lontas & M. DelliCarpini (Eds.), *The TESOL encyclopedia of English language teaching* (pp.1–7). John Wiley & Sons. <https://doi.org/10.1002/9781118784235.eelt0782>

- Rogers, J. (2019). Conceptualising collocations and multi-word units as the same through the conprogramming approach (Special Issue: A Dedication of Appreciation and Recognition of Service by Dr Yasumi Murata, Professor in the Faculty of Foreign Studies, Meijo University). *Meijo University Journal of the Faculty of Foreign Studies=名城大学外国語学部紀要*, 3, 147–151.
- Rogers, J. (2021). Essential features of language learning software. In J. Lontas (Ed.), *The TESOL encyclopedia of English language teaching* (pp.1–7). Wiley-Blackwell.
<https://doi.org/10.1002/9781118784235.eelt1007>
- Rogers, J., Brizzard, C., Daulton, F., Florescu, C., MacLean, I., Mimura, K., O'Donoghue, J., Okamotoe, M., Reida, G., & Shimada, Y. (2014). A methodology for identification of the formulaic language most representative of high-frequency collocations. *Vocabulary Learning and Instruction*, 3(1), 51–65. <https://doi.org/10.7820/vli.v03.1.2187-2759>
- Rogers, J., Brizzard, C., Daulton, F., Florescu, C., MacLean, I., Mimura, K., Okamotoe, M., Reida, G., & Shimada, Y. (2015). On using corpus frequency, dispersion, and chronological data to help identify useful collocations. *Vocabulary Learning and Instruction*, 4(2), 21–37. https://vli-journal.org/wp/wp-content/uploads/2015/12/VLI_I_4_02_Online.pdf#page=25
- Rogers, J., & Florescu, C. (2016). On L1 - L2 congruency as a criterion for the selection of multi-word units worthy of instruction. *名城大学人文紀要*, 52(2), 31–37.
<https://cir.nii.ac.jp/crid/1520290882500348800>
- Rogers, J., Müller, A., Daulton, F. E., Dickinson, P., Florescu, C., Reid, G., & Stoeckel, T. (2021). The creation and application of a large-scale corpus-based academic multi-word unit list. *English for Specific Purposes*, 62, 142–157.
<https://doi.org/10.1016/j.esp.2021.01.001>

- Sanosi, A. B. (2018). The effect of Quizlet on vocabulary acquisition. *Asian Journal of Education and e-Learning*, 6(4), 71–77. <https://doi.org/10.24203/ajeel.v6i4.5446>
- Schmidt, R. (1990). The role of consciousness in second language learning. *Applied Linguistics*, 11, 129–158. <https://doi.org/10.1093/applin/11.2.129>
- Schmidt, R. (1992). Awareness and second language acquisition. *Annual Review of Applied Linguistics*, 13, 206–226. <https://doi.org/10.1017/S0267190500002476>
- Schmitt, N. (1997). Vocabulary learning strategies. In N. Schmitt & M. McCarthy (Eds.), *Vocabulary: description, acquisition and pedagogy* (pp. 1–46). Cambridge University Press.
- Schmitt, N. (2008). Review article: Instructed second language vocabulary learning. *Language Teaching Research*, 12, 329–363. <https://doi.org/10.1177/1362168808089921>
- Schmitt, N. (2010). *Researching vocabulary: A vocabulary research manual*. Springer.
- Schmitt, N., & Carter, R. (2004). Formulaic sequences in action. In N. Schmitt (Ed.), *Formulaic sequences: Acquisition, processing and use* (pp. 1–22). John Benjamins Publishing.
- Schmitt, N., & Schmitt, D. (1995). Vocabulary notebooks: Theoretical underpinnings and practical suggestions. *ELT Journal*, 49(2), 133–143. <https://doi.org/10.1093/elt/49.2.133>
- Schmitt, N., Cobb, T., Horst, M., & Schmitt, D. (2015). How much vocabulary is needed to use English? Replication of van Zeeland & Schmitt (2012), Nation (2006) and Cobb (2007). *Language Teaching*, 50(2), 212–226. <https://doi.org/10.1017/S0261444815000075>

- Schmitt, N., Dornyei, Z., Adolphs, S., & Durow, V. (2004). Knowledge and acquisition of formulaic sequences: A longitudinal study. In N. Schmitt (Ed.), *Formulaic sequences: Acquisition, processing, and use* (pp. 55–86). John Benjamins.
- Schmitt, N., Dunn, K., O’Sullivan, B., Anthony, L., & Kremmel, B. (2021). Introducing knowledge-based vocabulary lists (KVL). *TESOL Journal*, *12*, e622.
<https://doi.org/10.1002/tesj.622>
- Schmitt, N., Schmitt, D., & Clapham, C. (2001). Developing and exploring the behaviour of two new versions of the Vocabulary Levels Test. *Language Testing*, *18*, 55–88.
<https://doi.org/10.1177/026553220101800103>
- Şen, B. Ö. (2019). Lexical collocation errors in literary translation. *Dil Dergisi*, *1*(170), 73–88.
<https://www.ceeol.com/search/article-detail?id=777747>
- Shin, D. (2006). *A collocation inventory for beginners*. [Unpublished doctoral dissertation]. Victoria University of Wellington.
https://openaccess.wgtn.ac.nz/articles/thesis/A_Collocation_Inventory_for_Beginners/16945729
- Shin, D. (2007). The high frequency collocations of spoken and written English. *English Teaching* (영어교육), *62*(1), 199–218. http://kate.bada.cc/wp-content/uploads/2015/02/kate_62_1_9.pdf
- Shin, D., & Chon, Y. V. (2019). A multiword unit analysis: COCA multiword unit list 20 and collogram. *Journal of Asia TEFL*, *16*(2), 608–623.
<https://doi.org/10.18823/asiatefl.2019.16.2.11.608>
- Shin, D., & Nation, P. (2008). Beyond single words: The most frequent collocations in spoken English. *ELT Journal*, *62*(4), 339–348. <https://doi.org/10.1093/elt/ccm091>

- Shokouhi, H., & Mirsalari, G. A. (2010). Collocational knowledge versus general linguistic knowledge among Iranian EFL Learners. *The Electronic Journal for English as a Second Language (TESL-EJ)*, 13(4), 1-24. <https://tesl-ej.org/pdf/ej52/a7.pdf>
- Simpson-Vlach, R., & Ellis, N. C. (2010). An academic formulas list: New methods in phraseology research. *Applied Linguistics*, 31(4), 487–512. <https://doi.org/10.1093/applin/amp058>
- Sinclair, J. (1991). *Corpus, concordance, collocation*. Oxford University Press.
- Sinclair, J. (2004). New evidence, new priorities, new attitudes. In J. Sinclair (Ed.), *How to use corpora in language teaching* (pp. 271–299). John Benjamins.
- Sivanova-Chanturia, A. (2015). On the ‘holistic’ nature of formulaic language. *Corpus Linguistics and Linguistic Theory*, 11(2), 285–301. <https://doi.org/10.1515/cllt-2014-0016>
- Sivanova-Chanturia, A., & Martinez, R. (2014). The idiom principle revisited. *Applied Linguistics*, 36(5), 549–569. <https://doi.org/10.1093/applin/amt054>
- Sivanova-Chanturia, A., & Pellicer-Sanchez, A. (Eds.). (2018). *Understanding formulaic language: A second language acquisition perspective*. Routledge.
- Sivanova-Chanturia, A., Conklin, K., & van Heuven, W. J. B. (2011). Seeing a phrase “time and again” matters: The role of phrasal frequency in the processing of multiword sequences. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, 37(3), 776–784. <https://doi.org/10.1037/a0022531>
- Snellings, P., Van Gelderen, A., & De Glopper, K. (2002). Lexical retrieval: An aspect of fluent second–language production that can be enhanced. *Language Learning*, 52(4), 723–754. <https://doi.org/10.1111/1467-9922.00202>
- Snoder, P., & Reynolds, B. L. (2019). How dictogloss can facilitate collocation learning in ELT. *ELT Journal*, 73(1), 41–50. <https://doi.org/10.1093/elt/ccy024>

- Someya, Y. (1998). E-lemma list.
http://www.antlab.sci.waseda.ac.jp/software/resources/e_lemma.zip
- Sonbul, S., & El-Dakhs, D. (2020). Timed versus untimed recognition of L2 collocations: Does estimated proficiency modulate congruency effects? *Applied Psycholinguistics*, 41(5), 1197–1222. <https://doi.org/10.1017/S014271642000051X>
- Sonbul, S., & Schmitt, N. (2013). Explicit and implicit lexical knowledge: Acquisition of collocations under different input conditions. *Language Learning*, 63, 121–159. <https://doi.org/10.1111/j.1467-9922.2012.00730.x>
- Sonbul, S., El-Dakhs, D. A. S., & Masrai, A. (2022). Second language productive knowledge of collocations: Does knowledge of individual words matter? *Studies in Second Language Acquisition*, 1–23. <https://doi.org/10.1017/S0272263122000341>
- Sonbul, S., El-Dakhs, D. A. S., & Alharbi, R. (2023). Rendering natural collocations in a translation task: The effect of direction, congruency, semantic transparency, and proficiency. *International Journal of Applied Linguistics*, 1–17. <https://doi.org/10.1111/ijal.12482>
- Stemler, S. (2004). A comparison of consensus, consistency, and measurement approaches to estimating inter-rater reliability. *Practical Assessment, Research & Evaluation*, 9(9), 1–11. <https://doi.org/10.7275/96jp-xz07>
- Stern, H. H. (1992). *Issues and options in language teaching*. Oxford University Press.
- Sung, Y. T., Chang, K. E., & Yang, J. M. (2015). How effective are mobile devices for language learning? A meta-analysis. *Educational Research Review*, 16, 68–84. <https://doi.org/10.1016/j.edurev.2015.09.001>
- Synnott, I. (2013). Review of the book *the company words keep: Lexical chunks in language teaching*, by P. Davis & H. Kryszewska (Eds). *English Australia Journal*, 29(1), 73–75. <https://cir.nii.ac.jp/crid/1130282269240046848>

- Szudarski, P. (2012). Effects of meaning- and formed-focused instruction on the acquisition of verb-noun collocations in L2 English. *Journal of Second Language Teaching and Research*, 1(2), 3–37. <https://pops.uclan.ac.uk/index.php/jsltr/article/view/32>
- Szudarski, P. (2017). Learning and Teaching L2 Collocations: Insights from Research. *TESL Canada Journal*, 34(3), 205–216. <http://dx.doi.org/10.18806/tesl.v34i3.1280>
- Szudarski, P., & Carter, R. (2016). The role of input flood and input enhancement in EFL learners' acquisition of collocations. *International Journal of Applied Linguistics*, 26(2), 245–265. <https://doi.org/10.1111/ijal.12092>
- Tajareh, M. J. (2015). An overview of contrastive analysis hypothesis. *Cumhuriyet Üniversitesi Fen Edebiyat Fakültesi Fen Bilimleri Dergisi*, 36(3), 1106–1113. <https://dergipark.org.tr/en/pub/cumuscij/issue/45132/564404>
- Taylor, V. A., & Bearden, W. O. (2002). The effects of price on brand extension evaluations: The moderating role of extension similarity. *Journal of the Academy of Marketing Science*, 30, 131–140. <https://link.springer.com/article/10.1177/03079459994380>
- Teng, F. (2018). Incidental vocabulary acquisition from reading-only and reading-while-listening: A multi-dimensional approach. *Innovation in Language Learning and Teaching*, 12(3), 274–288. <https://doi.org/10.1080/17501229.2016.1203328>
- Teng, F. (2019). The effects of video caption types and advance organisers on incidental L2 collocation learning. *Computers & Education*, 142, 10365. <https://doi.org/10.1016/j.compedu.2019.103655>
- Thao, M. T. P. (2020). Role of L1 in L2 acquisition according to contrastive analysis hypothesis and error analysis. *Journal of Education and Practice*, 11(2), 102–107. <https://doi.org/10.7176/JEP/11-2-11>
- Thomason, E. (n.d.). *Flashcards Deluxe*. <http://orangeorapple.com/Flashcards/>

- Tsai, K. (2015). Profiling the collocation use in ELT textbooks and learner writing. *Language Teaching Research*, 19(6), 723–740. <https://doi.org/10.1177/1362168814559801>
- Underwood, G., Schmitt, N., & Galpin, A. (2004). The eyes have it. In N. Schmitt (Ed.), *Formulaic sequences: Acquisition, processing, and use* (pp.153–173). John Benjamins Publishing Company.
- University of Pittsburgh. (n.d.). *Embargoed and sanctioned countries*. Retrieved July 13, 2022, from <https://www.tradecompliance.pitt.edu/embargoed-and-sanctioned-countries>
- Van der Meer, G. (1998, August). Collocations as one particular type of conventional word combinations: Their definition and character. In *Proceedings of the 8th Euralex Conference* (pp. 4–8).
- Vilkaitė-Lozdienė, L., & Schmitt, N. (2020). Frequency as a guide for vocabulary usefulness: high-, mid-, and low-frequency words. In Webb, S. (Ed), *The Routledge handbook of vocabulary studies* (pp. 81–96). Routledge. <https://doi.org/10.4324/9780429291586-10>
- Vu, D. V., & Michel, M. (2021). An exploratory study on the aspects of vocabulary knowledge addressed in EAP textbooks. *Dutch Journal of Applied Linguistics*, 10, 1–15. <https://doi.org/10.51751/dujal9345>
- Vu, D. V., & Peters, E. (2022a). Incidental learning of collocations from meaningful input: A longitudinal study into three reading modes and factors that affect learning. *Studies in Second Language Acquisition*, 44(3), 685–707. <https://doi.org/10.1017/S0272263121000462>
- Vu, D. V., & Peters, E. (2022b). The role of formulaic sequences in L2 speaking. In T. Derwing, M. Munro, & R. Thomson (Eds.), *The Routledge handbook of second language acquisition and speaking*, (pp. 285–298). Routledge.

- Vu, D. V., & Peters, E. (2023). A longitudinal study on the effect of mode of reading on incidental collocation learning and predictors of learning gains. *Tesol Quarterly*, 57(1), 5–32. <https://doi.org/10.1002/tesq.3111>
- Waller, T. (1993). Characteristics of near-native proficiency in writing. In H. Ringbom, H. (ed). *Near native proficiency in English* (pp. 183–293). Åbo, Finland: English Department, Åbo Akademi University.
- Wang, Y., & Shaw, P. (2008). Transfer and universality: Collocation use in advanced Chinese and Swedish learner English. *ICAME journal*, 32, 201–232.
- Waring, R., & Nation, I. S. P. (1997). Vocabulary size, text coverage, and word lists. In N. Schmitt & M. McCarthy (Eds.), *Vocabulary: Description, acquisition and pedagogy* (pp. 6–19). Cambridge University Press.
- Webb, S. (Ed.). (2020a). Incidental vocabulary learning. In *The Routledge handbook of vocabulary studies* (pp. 225–239). Routledge.
<https://doi.org/10.4324/9780429291586-10>
- Webb, S. (Ed.). (2020b). Introduction. In *The Routledge handbook of vocabulary studies* (pp. 1–12). Routledge. <https://doi.org/10.4324/9780429291586>
- Webb, S. (Ed.). (2020c). *The Routledge handbook of vocabulary studies*. Routledge. <https://doi.org/10.4324/9780429291586>
- Webb, S., & Kagimoto, E. (2009). The effects of vocabulary learning on collocation and meaning. *TESOL Quarterly*, 43(1), 55–77. <https://doi.org/10.1002/j.1545-7249.2009.tb00227.x>
- Webb, S., & Kagimoto, E. (2011). Learning collocations: Do the number of collocates, position of the node word, and synonymy affect learning? *Applied Linguistics*, 32(3), 259–276. <https://doi.org/10.1093/applin/amq051>

- Webb, S., & Nation, I. S. P. (2008). Evaluating the vocabulary load of written text. *TESOLANZ Journal: The Journal of the TESOL Association of Aotearoa New Zealand*, 16, 1–10. file:///C:/Users/mbarg/Downloads/2008-Webb-Evaluating-vocabulary-load.pdf
- Webb, S., & Nation, I. S. P. (2017). *How vocabulary is learned*. Oxford University Press.
- Webb, S., Newton, J., & Chang, A. (2013). Incidental learning of collocation. *Language Learning*, 63(1), 91–120. <https://doi.org/10.1111/j.1467-9922.2012.00729.x>
- Webb, S., Yanagisawa, A., & Uchihara, T. (2020). How effective are intentional vocabulary-learning activities? A meta-analysis. *The Modern Language Journal*, 104(4), 715–738. <https://doi.org/10.1111/modl.12671>
- West, M. (1953). *A general service list of English words*. Longman, Green & Co.
- Wilkinson, D. (2020). *Effects of word card methodology and testing on vocabulary knowledge and motivation* [Unpublished Doctoral dissertation]. Temple University. <https://scholarshare.temple.edu/handle/20.500.12613/308>
- Wilks, Y. (2005). REVEAL: the notion of anomalous texts in a very large corpus. *Tuscan Word Centre International Workshop: Dial a Corpus*. Certosa di Pontignano, Tuscany, Italy, 31 June–3 July 2005.
- Williams, G. (2002). In search of representativity in specialised corpora: Categorisation through collocation. *International Journal of Corpus Linguistics*, 7(1), 43–64. <https://doi.org/10.1075/ijcl.7.1.03wil>
- Wolter, B. (2006). Lexical network structures and L2 vocabulary acquisition: The role of L1 lexical/conceptual knowledge. *Applied Linguistics*, 27(4), 741–747. <https://doi.org/10.1093/applin/aml036>

- Wolter, B. (2020). Key Issues in teaching multiword items. In Webb, S. (Ed), *The Routledge handbook of vocabulary studies* (pp. 493–510). Routledge.
<https://doi.org/10.4324/9780429291586-31>
- Wolter, B., & Gyllstad, H. (2011). Collocational links in the L2 mental lexicon and the influence of L1 intralexical knowledge. *Applied Linguistics*, 32(4), 430–449.
<https://doi.org/10.1093/applin/amr011>
- Wolter, B., & Gyllstad, H. (2013). Frequency of input and L2 collocational processing: A comparison of congruent and incongruent collocations. *Studies in Second Language Acquisition*, 35(3), 451–482. <https://doi.org/10.1017/S0272263113000107>
- Wolter, B., & Yamashita, J. (2015). Processing collocations in a second language: A case of first language activation? *Applied Psycholinguistics*, 36(5), 1193–1221.
<https://doi.org/10.1017/S0142716414000113>
- Wolter, B., & Yamashita, J. (2018). Word frequency, collocational frequency, L1 congruency, and proficiency in L2 collocational processing: What accounts for L2 performance? *Studies in Second Language Acquisition*, 40(2), 395–416.
<https://doi.org/10.1017/S0272263117000237>
- Wood, D. (2020). Classifying and Identifying Formulaic Language. In S. Webb. (Ed), *The Routledge handbook of vocabulary studies* (pp. 30–45). Routledge.
<https://doi.org/10.4324/9780429291586-31>
- Woolard, G. (2000). Collocation – encouraging learner independence. In M. Lewis (Ed.), *Teaching collocation: Further developments in the lexical approach* (pp. 28–46). Language Teaching Publications.
- Worthington, D., & Nation, I. S. P. (1996). Using texts to sequence the introduction of new vocabulary in an EAP Course. *RELC Journal* 27(2), 1–11.
<https://doi.org/10.1177/003368829602700201>

- Wray, A. (2000). Formulaic sequences in second language teaching: Principles and practice. *Applied Linguistics*, 21(4), 463–489. <https://doi.org/10.1093/applin/21.4.463>
- Wray, A. (2002). *Formulaic language and the lexicon*. Cambridge University Press.
- Wray, A. (2008). *Formulaic language: Pushing the boundaries*. Oxford University Press.
- Wyra, M., & Lawson, M. J. (2018). Foreign language vocabulary learning using the keyword method: strategy and meta-strategy knowledge. *The Language Learning Journal*, 46(5), 605–621. <https://doi.org/10.1080/09571736.2018.1503138>
- Yamagata, S., Nakata, T., & Rogers, J. (2023). Effects of distributed practice on the acquisition of verb-noun collocations. *Studies in Second Language Acquisition*, 45(2), 291–317. <https://doi.org/10.1017/S0272263122000225>
- Yamashita, J. (2018). Possibility of semantic involvement in the L1 - L2 congruency effect in the processing of L2 collocations. *Journal of Second Language Studies*, 1(1), 60–78. <https://doi.org/10.1075/jsls.17024.yam>
- Yamashita, J., & Jiang, N. (2010). L1 Influence on the acquisition of L2 collocations: Japanese ESL Users and EFL learners acquiring English collocations. *TESOL Quarterly*, 44(4), 647–668. <https://doi.org/10.5054/tq.2010.235998>
- Yüksel, H. G., Mercanoğlu, H. G., & Yılmaz, M. B. (2022). Digital flashcards vs. wordlists for learning technical vocabulary. *Computer Assisted Language Learning*, 35(8), 2001–2017. <https://doi.org/10.1080/09588221.2020.1854312>
- Zareva, A., & Shehata, A. (2015). At the Intersection of L1 Congruence and L2 Exposure: Collocational Knowledge of Advanced Arab Users of English. *International Journal of Arabic-English Studies*, 5, 77–102. <https://doi.org/10.33806/ijaes2000.15.1.6>
- Zareva, A., Schwanenflugel, P., & Nikolova, Y. (2005). Relationship between lexical competence and language proficiency: Variable sensitivity. *Studies in Second Language Acquisition*, 27(4), 567–595. <https://doi.org/10.1017/S0272263105050254>

- Zhang, X. (1993). *English collocations and their effect on the writing of native and non-native college freshmen* [Unpublished doctoral dissertation]. Indiana University of Pennsylvania.
- Zhang, X. (2017). Effects of receptive-productive integration tasks and prior knowledge of component words on L2 collocation development. *System (Linköping)*, 66, 156–167.
<https://doi.org/10.1016/j.system.2017.03.019>
- Zhou, X. (2016). A corpus-based study on high frequency verb collocations in the case of “HAVE”. *International Forum of Teaching and Studies*, 12(1), 42–50.
<http://americanscholarspress.us/journals/IFST/pdf/IFOTS-1-2016/v12n1-art6.pdf>
- Ziafar, M. (2015). Good Language Learners and their Use of Lexical Items and L1 in Second Language Acquisition. *International Scientific Research Journal*, 1(5), 1–9.
<https://doi.org/10.18483/IRJSci.1>

APPENDICES

Please note that all appendices are samples of data. The full results can be viewed via hyperlinks as indicated.

Appendix A L1 - L2 Congruency Ratings

Table A1 provides the first 20 items of L1 - L2 ratings from Rogers's (2017a) list. The full results can be viewed via the link: <https://jamesmartinrogers.wixsite.com/mwusforpersians>

Table A1

Sample of L1 - L2 Congruency Ratings

Frequency	Collocate	POS	Pivot Word	POS	Multi-Word Unit	Rating	Translation
218547	do	v	know	v	don't know	12	نمی دانم
156252	do	v	think	v	I don't think	12	فکر نمی کنم
139693	do	v	want	v	I don't want to	9	من نمی خواهم
111075	do	v	how	r	how do you	4	چطوری
97698	have	v	never	r	had never	12	هرگز
88481	have	v	year	n	years has	12	سالها
84034	year	n	ago	r	2 years ago	12	2سال پیش
81308	will	v	have	v	I will have	12	خواهم داشت
67581	do	v	why	r	why do	12	چرا انجام دهید
62559	right	r	all	r	all right	0	خیلی خوب
58717	as	r	well	r	as well	6	همچنین
54656	know	v	how	r	know how to	8	دانستن اینکه چگونه
54032	school	n	high	j	high school	6	دبیرستان
51648	have	v	ever	r	has ever	12	تا کنون
50745	up	r	pick	v	to pick up	6	برداشتن
50603	up	r	come	v	come up with	4	پیشنهاد کردن
50331	already	r	have	v	had already	12	قبلاً
50212	go	v	back	r	to go back to	6	بازگشت به
49953	come	v	back	r	come back	6	برگشتن

Appendix B Low L1 - L2 Rating

The cut-off of 6 points was run to identify MWU items with low L1 - L2 ratings. The result was used to create the digital format of the MWU list. The full results can be viewed via the link: <http://secureapp.au/4600/>. Table B1 provides a sample of MWUs with low L1 - L2 ratings.

Table B1

Sample of MWUs with Low L1 - L2 Rating

MWU	Rating	Persian Translation
to take over	0	به عهده گرفتن
went off	0	منفجر کردن
community college	0	موسسه آموزشی
put out	0	خاموش کردن
caught up	0	درگیر
to the rest of the world	3	از نظر بقیه دنیا
to take responsibility for	3	مسئولیت پذیرفتن
to cut down on	3	کاهش دادن
made up your mind	3	تصمیم خود را گرفتید
how to deal with	3	کنار بیایم
to make sense of	4	برای ایجاد حس
take off your	4	دربیار
go ahead and	4	پیش بروید و
in part because	4	به دلیل
pay attention to	4	توجه کن به
make up	6	درست کردن
decision making	6	تصمیم گیری
took place	6	برگزار شد
to get back to	6	برای بازگشت به
looked up	6	جستجو کردن

Appendix C Semantic Transparency Classification

Table C1 illustrates a sample of MWUs based on semantic transparency classification. The full results can be viewed via the link: <https://researchdata.edu.au/full-mwu-listxlsx/2828307>

Table C1

Sample of MWUs Based on Semantic Transparency Classification

Frequency	Collocate	POS	Pivot Word	POS	Multi-Word Unit	Semantic
47299	see	v	can	v	can see	12
46988	do	v	mean	v	doesn't mean	12
46349	will	v	say	v	said it will	12
46326	go	v	out	r	to go out	12
46268	do	v	really	r	don't really	12
44999	can	v	get	v	you can get	12
44461	have	v	hear	v	I have heard	12
40689	do	v	like	v	I don't like	12
40377	do	v	need	v	don't need	12
38635	would	v	think	v	I thought I would	12
38484	out	r	there	r	out there	12
38173	how	r	can	v	how can I	12
37723	come	v	out	r	come out	12
37387	no	r	long	r	no longer	6
37174	up	r	get	v	get up	4
37087	find	v	out	r	to find out	8
36581	have	v	leave	v	they have left	12
35406	could	v	see	v	I could see	12
35020	make	v	sure	j	make sure that	12
34491	get	v	out	r	get out of the	12
31570	health	n	care	n	of health care	12
31477	will	v	take	v	it will take	12
31221	so	r	far	r	so far	0

Note: The semantic points are just like symbols:

- Literals (12 points)
- ONCE or Semi-Figurative (8 points)
- Figurative (4 points)
- Core idioms (0 points)
- Outliers (6 points).

Appendix D Number of Items in Each Frequency Level

The number of items in each frequency band based on L1 - L2 congruency and semantic transparency are provided in Tables D1 to D4.

Table D1

Number of Items in First Frequency Band Organised by L1 - L2 Congruency and Transparency Classification (F1= 2,803)

L1 - L2 Rating	Literal	Opaque
0-4	245	177
6-8	1072	191
9-12	1086	32

Table D2

Number of Items in Second Frequency Band Organised by L1 - L2 Congruency and Transparency Classification (F2= 2,803)

L1 - L2 Rating	Literal	Opaque
0-4	387	169
6-8	1191	170
9-12	844	42

Table D3

Number of Items in Third Frequency Band Organised by L1 - L2 Congruency and Transparency Classification (F3= 2,803)

L1 - L2 Rating	Literal	Opaque
0-4	295	211
6-8	957	148

9-12	1132	60
------	------	----

Table D4

Number of Items in Fourth Frequency Band Organised by L1 - L2 Congruency and Transparency Classification (F4= 2,803)

L1 - L2 Rating	Literal	Opaque
0-4	173	132
6-8	668	140
9-12	1582	108

Appendix E MWUs Test Items

Table E1 provides the items of productive MWU test based on the L1 - L2 congruency rating, semantic transparency classification, congruency, transparency, and frequency levels. Also, this section illustrates the format of the MWU test.

Table E1

MWUS Test Items by Organising Congruency, Semantic Transparency from Four Frequency Levels

No	MWUs Items	L1 - L2	Semantic	Congruency	Semantic	Frequency
1	a survey conducted	4	12	0	1	F1
2	engage in activities	4	6	0	0	
3	the visual arts	6	8	0	1	
4	buy stock	6	12	0	1	
5	devices used	8	12	1	1	
6	violated the law	9	12	1	1	
7	is far less than	9	6	1	0	
8	the national level	12	12	1	1	
9	environmental regulations	4	12	0	1	F2
10	master bedroom	3	8	0	0	
11	pouring in	6	4	0	0	
12	a major concern	6	12	0	1	
13	housing project	6	12	0	1	
14	more democratic	12	12	1	1	

15	was signed into law	9	12	1	1	
16	reasonable doubt	12	6	1	0	
17	seized the opportunity	4	12	0	1	F3
18	drift off	0	4	0	0	
19	security officer	6	12	0	1	
20	folk music	6	12	0	1	
21	lined the streets	6	8	0	0	
22	scientific knowledge	12	12	1	1	
23	quite enough	12	12	1	1	
24	free exercise	12	6	1	0	
25	the preliminary hearing	3	12	0	1	F4
26	a guilty plea	4	6	0	0	
27	the purchase price of	8	12	1	1	
28	rising interest rates	8	12	1	1	
29	assume the position	8	0	1	0	
30	looked puzzled	9	12	1	1	
31	in neighbouring countries	12	12	1	1	
32	the glory days	9	4	1	0	

Note: Congruency was divided into congruent items (1) and incongruent items (0). Semantic transparency was divided into literal (1) and opaque items (0)

The full format of the MWUs test can be viewed via the link:

<https://docs.google.com/forms/d/e/1FAIpQLSdhJZT7UHchyYADV76taTmdd7SQFq7Qp-97DeK0y3wp5YCTXw/viewform>

It is a sample of the MWU test items.

➤ **IELTS Scores:**

1. A sur_ _ _ conducted among teens showed a clear preference for our products.
2. If they eng_ _ _ in activities like that, a player will be kicked off of the team.
3. I graduated college with a degree in the vis_ _ _ arts.
4. I would buy st_ _ _ in that company if I had any money.
5. Airport security is now required to take this course to learn more about explosive dev_ _ _ _ used by terrorists.
6. He viol_ _ _ _ the law, and now he must go to prison for ten years.
7. Fifty dollars is far le_ _ than I hoped to get for selling my guitar.
8. To reach the nati_ _ _ _ level of any sport is a real accomplishment for athletes.
9. He thinks environmental regul_ _ _ _ _ _ help the Earth but hurt business.
10. We are looking to buy a house with a big mas _ _ _ bedroom
11. Letters of sympathy came pou_ _ _ _ n when people heard the sad story of the lost dog.
12. A major con_ _ _ _ for an inexperienced mother is whether or not her baby is eating enough.
13. The housing pro _ _ _ _ was initiated to help provide affordable housing to low-income families.
14. The dictator was asked to make his country more democ_ _ _ _ , but he refused. He liked to be in total control.
15. The bill was sig_ _ _ into law, so be careful, or you could be arrested.
16. You must be sure beyond a reason_ _ _ _ _ doubt that he killed her.
17. When our production manager quit, I sei_ _ _ the opportunity and became the new manager the next day.


18. Sometimes, when a teacher is boring, a few students in my class will dri _ _ off.
19. A security off _ _ _ _ questioned me at the airport.
20. Traditionally, factory workers and farmers would sing fo _ _ music while they were working.
21. Last December, the city government li _ _ _ the streets with Christmas lights for the holiday season.
22. The man's scien _ _ _ _ _ knowledge is what allowed him to join the space station team.
23. I have had quite eno _ _ _ of this music. It is hurting my ears.
24. They demanded the free exer _ _ _ _ of their right to gather.
25. The preli _ _ _ _ _ hearing on the new tobacco law will be held tomorrow.
26. Of course, the quickest way to end this trial is a guilty pl _ _ .
27. The purc _ _ _ _ price of our new home was reached after a series of offers and counter offers.
28. Over the last few years, we have had rising inte _ _ _ _ rates.
29. The dance instructor told her students to ass _ _ _ the position.
30. The students in the mathematics class looked puz _ _ _ _ after every lesson.
31. Refugee camps in neighb _ _ _ _ _ countries became overwhelmed as the civil war became worse.
32. Remember when we won the championship? Those were the gl _ _ _ days, huh?

Appendix F Participant Information Sheet

Due to the restrictions imposed by COVID, the test was run via online formats with the start to sign the consent form. Please note that the *participant information sheet* utilised in this study was summarised on Google Docs forms based on Flinders University format, following the link:

<https://docs.google.com/forms/d/e/1FAIpQLSdhJZT7UHchyYADV76taTmdd7SQFq7Qp-97DeK0y3wp5YCTXw/viewform>

Therefore, this sample was provided for demonstration.



PARTICIPANT INFORMATION SHEET AND CONSENT FORM

Teaching Collocations Based on Lemmatised Congrams to Persian Learners of English

Chief Investigator

Maryam Barghamadi
PhD Candidate
College of Nursing and Health Sciences
Flinders University
Tel: +61405593783

Supervisor

Dr Amanda Müller
College of Nursing and Health Sciences
Flinders University
Tel: +61 8 82013378

Description of the study

This project will investigate the Iranian students' collocational knowledge (MWUs) by examining 32 items. This project is supported by Flinders University, College of Nursing and Health Sciences.

Purpose of the study

This project aims to find out that there is a correlation between advanced students' knowledge of MWUs and IELTS scores.

Benefits of the study

The sharing of your experiences will help to develop a new resource for learning English collocations.

Participant involvement and potential risks

If you agree to participate in the research study, you will be asked to:

- Attend a fill in gap paper exam test that includes 30 items in 20 minutes.

The researchers do not expect the questions to cause any harm or discomfort to you. However, if you experience feelings of distress as a result of participation in this study, please let the research team know immediately. You can also contact directly to the researcher via:

- barz008@flinders.edu.au
- ma_barghamadi@yahoo.com

Withdrawal Rights

You may, without any penalty, decline to take part in this research study. If you decide to take part and later change your mind, you may, without any penalty, withdraw at any time without explaining. To withdraw, may just refuse to answer any questions / close the internet browser and leave the test. Any data collected up to the point of your withdrawal will be securely destroyed.

Confidentiality and Privacy

Only researchers listed on this form have access to the individual information provided by you. Privacy and confidentiality will be assured at all times. The research outcomes may be presented at conferences, written up for publication or used for other research purposes as described in this information form. However, the privacy and confidentiality of individuals will be protected at all times. You will not be named, and your individual information will not be identifiable in any research products without your explicit consent.

No data, including identifiable, non-identifiable and de-identified datasets, will be shared or used in future research projects without your explicit consent.

Data Storage

The information collected may be stored securely on a password protected computer and/or Flinders University server throughout the study. Any identifiable data will be de-identified for data storage purposes unless indicated otherwise. All data will be securely transferred to and stored at Flinders University for five years after publication of the results. Following the required data storage period, all data will be securely destroyed according to university protocols.

How will I receive feedback?

On project completion, a short summary of the outcomes will be provided to all participants via email or published on Flinders University's website and the institute's website.

Ethics Committee Approval

The project has been approved by Flinders University's Human Research Ethics Committee (Project number: 4365).

CONSENT FORM

Consent Statement

- I have read and understood the information about the research, and I understand I am being asked to provide informed consent to participate in this research study. I understand that I can contact the research team if I have further questions about this research study.
- I am not aware of any condition that would prevent my participation, and I agree to participate in this project.
- I understand that I am free to withdraw at any time during the study.
- I understand that I can contact Flinders University's Research Ethics & Compliance Office if I have any complaints or reservations about the ethical conduct of this study.
- I understand that my involvement is confidential, and that the information collected may be published. I understand that I will not be identified in any research products.

I further consent to: *delete/add boxes as required*

- completing a paper exam
- sharing my de-identified data with other researchers

Signed:

Name (Optional):

Date:

Appendix G MWU Test Results

Table G1 indicates a sample of MWU test results. The full results of MWUs test can be viewed via the link: https://open.flinders.edu.au/articles/dataset/MWU_Test_Results-Maryam_xlsx/24288985

Table 33

Sample of MWU Test Results

IELTS Score	MWUs Test Score	%	F1	F2	F3	F4	congruent	incongruent	Semantic Transparency	Opaque
7	23	71.875	8	6	4	5	14	9	15	8
6.5	18	56.25	6	4	4	4	11	7	14	4
6	18	56.25	5	5	4	4	9	9	13	5
8.5	29	90.625	8	7	7	7	15	14	19	10
6	22	68.75	6	6	5	5	13	9	16	6
5.5	18	56.25	4	6	2	6	10	8	11	7
7.5	18	56.25	5	4	4	5	12	6	10	8
8	24	75	8	7	5	4	13	11	16	8
7.5	25	78.125	7	6	6	6	13	12	15	10
5.5	11	34.375	5	4	1	1	8	3	9	2
6	17	53.125	4	4	5	4	10	7	11	6
6.5	18	56.25	6	5	3	4	10	8	13	5
8.5	25	78.125	7	6	5	7	14	11	17	8
5.5	4	12.5	0	3	1	0	2	2	3	1
6	15	46.875	4	2	5	4	10	5	11	4
7.5	26	81.25	8	7	6	5	14	12	18	8
8	26	81.25	7	7	5	7	14	12	18	8
7	22	68.75	8	3	6	5	13	9	16	6
5.5	21	65.625	5	7	5	4	10	11	12	9
6	15	46.875	5	2	4	4	10	5	10	5
8.5	28	87.5	8	7	6	7	14	14	19	9
7.5	26	81.25	7	6	6	7	14	12	17	9
6.5	18	56.25	4	6	3	5	11	7	11	7
7.5	14	43.75	4	3	4	3	9	5	6	8
8	28	87.5	8	6	6	8	15	13	18	10
6.5	20	62.5	7	5	4	4	13	7	15	5

Appendix H Human Ethics Approval

This sample is provided for demonstration. Please note that this approval has been extended until 1/04/2024. Also, it is essential to note that the title of this research has been modified from “Teaching Collocations based on Lemmatized Concgrams to Persian Learners of English” to “Identifying and Teaching English Collocations for Persian Students”.

1 June 2021



HUMAN ETHICS LOW RISK PANEL APPROVAL NOTICE

Dear P.h.D student Maryam Barghamad,

The below proposed project has been approved on the basis of the information contained in the application and its attachments.

Project No: 4365
Project Title: Teaching Collocations Based on Lemmatized Concgrams to Persian Learners of English
Primary Researcher: P.h.D student Maryam Barghamad
Approval Date: 01/05/2021
Expiry Date: 30/04/2022

Please note: Due to the current COVID-19 situation, researchers are strongly advised to develop a research design that aligns with the University's COVID-19 research protocol involving human studies. Where possible, avoid face-to-face testing and consider rescheduling face-to-face testing or undertaking alternative distance/online data or interview collection means. For further information, please go to <https://staff.flinders.edu.au/coronavirus-information/research-updates>.

RESPONSIBILITIES OF RESEARCHERS AND SUPERVISORS

1. Participant Documentation

Please note that it is the responsibility of researchers and supervisors, in the case of student projects, to ensure that:

- all participant documents are checked for spelling, grammatical, numbering and formatting errors. The Committee does not accept any responsibility for the above mentioned errors.
- the Flinders University logo is included on all participant documentation (e.g., letters of introduction, Information Sheets, consent forms, debriefing information and questionnaires – with the exception of purchased research tools) and the current Flinders University letterhead is included in the header of all letters of introduction. The Flinders University international logo/letterhead should be used and documentation should contain international dialing codes for all telephone and fax numbers listed for all research to be conducted overseas.

2. Annual Progress / Final Reports

In order to comply with the monitoring requirements of the *National Statement on Ethical Conduct in Human Research 2007* (updated 2010) an annual progress report must be submitted each year on the approval anniversary date for the duration of the ethics approval using the HREC Annual/Final Report Form available online via the ResearchNow Ethics & Biosafety system.

Please note that no data collection can be undertaken after the ethics approval expiry date listed at the top of this notice. If data is collected after expiry, it will not be covered in terms of ethics. It is the responsibility of the researcher to ensure that annual progress reports are submitted on time, and that no data is collected after ethics has expired.

If the project is completed before ethics approval has expired please ensure a final report is submitted immediately. If ethics approval for your project expires please **either** submit (1) a final report, **or** (2) an extension of time request (using the HREC Modification Form).

For **student projects**, the Low Risk Panel recommends that current ethics approval is maintained until a student's thesis has been submitted, assessed and finalised. This is to protect the student in the event that reviewers recommend that additional data be collected from participants.

3. Modifications to Project

Modifications to the project must not proceed until approval has been obtained from the Ethics Committee. Such proposed changes / modifications include:

6/3/22, 1:34 PM

Email - Maryam Barghamadi - Outlook

RE: Renew (Expiry Date)

Human Research Ethics <human.researchethics@flinders.edu.au>

Tue 10/05/2022 17:10

To: Maryam Barghamadi <barg0008@flinders.edu.au>

Dear Maryam,

Apologies for not replying sooner – I am just clearing out the inbox and found this e-mail.

Your project (4365) is approved until 01/04/2024 and you can still recruit and collect your data until this date.

Cheers,

Cam

Human Research Ethics
Research Ethics and Compliance
Research Development and Support (DVCR)

Registry Building Basement
Flinders University
Sturt Road, Bedford Park, South Australia, 5042
GPO Box 2100, Adelaide, South Australia, 5001

Ac
Go