Investigating the Use of an Online Perfectionism Intervention for Disordered Eating

By

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TABLE OF CONTENTS

Abstract

Perfectionism is a multifaceted construct which is characterised by inflexible high standards, self-criticism, and concern over mistakes. Perfectionism has been suggested to contribute to the development and maintenance of eating disorders through perfectionistic tendencies being applied to dieting behaviours as well as to control over weight, shape and eating. Interventions tackling perfectionism have shown an impact on symptoms of eating disorders, depression, and anxiety. Online interventions provide a means to increase access to mental health care and offers a low intensity option for individuals considered at-risk of developing an eating disorder. This thesis examined the use of an eight-module online intervention targeting perfectionism, evaluating efficacy in people with disordered eating before conducting effectiveness research in an uncontrolled real-world setting.

The first study reviewed previous perfectionism interventions which have examined disordered eating as an outcome through a systematic search and meta-analysis. Robust effects were observed for the reduction of perfectionism and disordered eating, and moderate effects were described for the reduction of depression and anxiety. The second study was a preliminary uncontrolled feasibility trial of the perfectionism intervention in an online and a university cohort. Qualitative feedback from the university cohort and unsuccessful recruitment attempts in the online cohort led to the revision of intervention content and recruitment strategies ahead of further evaluation. The third study included a fully powered randomised control trial comparing the interactive online intervention format against a static cognitive behavioural therapy intervention for perfectionism. Both active interventions were successful at reducing eating disorder symptom severity compared to control, though a greater number of significant effects were observed for the online interactive format. An implementation feasibility trial was then conducted at a university in the United Kingdom reported against the RE-AIM framework. Due to the limited success of the recruitment efforts and unsustained adoption of the program, a final scoping review was conducted to investigate methods to improve reach and uptake of online mental health interventions across all

disorders. The scoping review mapped current efforts to improve initial online engagement and provide suggestions for future initiatives in this area. Despite the proven efficacy of the online perfectionism intervention for reducing perfectionism and related symptomology, further work is needed to optimise the use of digital mental health platforms such that the effectiveness of such programs is capitalised on. Across these studies new information is provided about the feasibility, effectiveness, and current limitations of using online perfectionism interventions to treat disordered eating as an indicative intervention approach.

DECLARATION

I certify that this thesis:

1. does not incorporate without acknowledgment any material previously submitted for a degree or diploma in any university

2. and the research within will not be submitted for any other future degree or diploma without the permission of Flinders University; and

3. to the best of my knowledge and belief, does not contain any material previously published or written by another person except where due reference is made in the text.

Signed   *K. Robinson*

Date: 10th May 2024

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To Tracey Wade, thank you for being an outstanding supervisor and for pushing me to achieve greater things than I could have imagined. Completing my PhD with you has felt like standing on the shoulders of giants. I don't know if anyone else could have gotten me across that finishing line and allowed me to achieve one of my biggest life goals. Thank you for giving me the opportunity to complete my PhD under your awesome knowledge and guidance, I couldn't have hoped for a better supervisor.

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CHAPTER ONE: OVERVIEW[1]

[1] This chapter contains content from two published papers that are provided in **Appendices.**

The first study described in this chapter is detailed below and can be found in **Appendix A**. First author contributed 20% to the research design, 80% to data collection and analysis, and 80% to the writing and editing. Second author contributed 80% to the research design, 20% to data collection and analysis, and 20% to the writing and editing.

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Eating Disorders

Eating disorders (EDs) are debilitating, costly, and potentially fatal, mental disorders associated with impaired psychosocial functioning and poor quality of life (Zipfel et al., 2022). In 2019, the global estimate for number of people with an ED was 55.5 million (Santomauro et al., 2021). Since then, the COVID-19 pandemic saw a significant increase in the number of new and recurring cases (McLean et al., 2022; Phillipou et al., 2020; Phillipou et al., 2021; Tavolacci et al., 2021; Zipfel et al., 2022). Six main categories of feeding and eating disorders are defined in the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition, Text Revision (DSM-5-TR; American Psychiatric Association, 2022). Three of these disorders (anorexia nervosa, bulimia nervosa, and binge eating disorder) plus two residual diagnostic categories (other specified and unspecified feeding and eating disorders) as well as disordered eating, provide the focus for this thesis and for the intervention tested in subsequent chapters. Disordered eating is defined as a global eating disorder psychopathology which encompasses a range of eating cognitions and behaviours that are driven by a desire to control weight, shape, and diet. These traits may or may not warrant the diagnosis of a specific eating disorder, but body image concern and disordered eating have been robustly shown to predict the development of subsequent clinically recognised EDs (Alhaj et al., 2022; Jacobi et al., 2011; Killen et al., 1996) and are important to target in early intervention approaches.

Intervention Access for Disordered Eating

Both current treatment options and current treatment access for EDs is suboptimal. It is estimated than less than one-quarter of individuals with an ED will access treatment and of those, less than one-third will receive an evidence-based psychosocial intervention (Hamilton et al., 2022; Hart et al., 2011; Kazdin et al., 2017; Murray, 2019). Rates of help-seeking for

EDs has been estimated between 35-63%, depending on diagnosis, with rates being as low as 10% for adolescents (Fatt et al., 2020). Common barriers for seeking face-to-face treatment include geographical isolation, cost, poor case identification, poor mental health literacy, and therapist availability (Ali et al., 2020; Alan E. Kazdin et al., 2017; Linardon et al., 2021). The need for early access to treatment is imperative as early detection and intervention has been associated with increased likelihood of recovery (Treasure & Russell, 2011).

Adolescents and young adults are at the greatest risk for the development of EDs, with average age of onset between 12-25 years old (Volpe et al., 2016). As the age of onset coincides with the majority demographic of first-degree university students, it is unsurprising that an estimated 1 in 5 (20%) of undergraduate students exhibit disordered eating. Due to the increased psychosocial stressors faced by young adults at university, access to mental healthcare within higher education institutes is imperative for student wellbeing. There is robust evidence to suggest that rates of EDs, depression, anxiety are significantly higher in university students post-pandemic (Daly & Costigan, 2022; Tavolacci et al., 2021; Yuan et al., 2022). Consequently, the pressure on university counselling services has also increased drastically, leading to higher demands for early intervention and low intensity options such that student support can be appropriately triaged and provided for mental health concerns of varying severity.

Online Interventions for Disordered Eating

Online psychological interventions are increasing in popularity and are becoming more widely considered as viable alternatives to face-to-face therapy, with the potential to address some of the barriers experienced when accessing the latter. Online interventions provide a gateway for accessing digitally connected youths and self-guided interventions have the potential to be scalable, easily accessible due to their low cost, immediate

availability, and ability to be completed without clinician support. They have been suggested to be important in the stepped care approach for ED treatment as they can be tailored to use in universal, selective, or indicative interventions (Wade & Wilksch, 2018). Universal prevention targets an entire population, with the intervention having some relevancy to every individual irrespective of their level of risk. Selective intervention targets sub-populations who are thought to be at risk based on some demographic variable, such as age or gender. Indicative interventions target those who have been identified as endorsing sub-clinical symptoms of a disorder and may consequently be considered at-risk for the future development of the targeted disorder (Wade & Wilksch, 2018). It is important to look for ways to engage young adults in indicative intervention programs in a way that is both accessible and acceptable to them. Most of the work in early intervention for young adults has used cognitive behaviour therapy approaches for disordered eating (Fitzsimmons-Craft et al., 2020; Fitzsimmons-Craft et al., 2021; Fitzsimmons-Craft et al., 2022). Treatment for perfectionism, however, may be an alternative avenue to early intervention that can provide a "back-door" approach to targeting disordered eating that overcomes the treatment barrier of denial (Radunz et al., 2023)

Targeting Perfection as an Early Intervention for Disordered Eating

Perfectionism is a multi-faceted construct with key components including high personal standards, excessive concern over mistakes, fear of negative evaluation, and self-criticism (Frost et al., 1990). Perfectionism is both a risk and maintenance factor for depression, anxiety, suicidal ideation, EDs, and disordered eating behaviours (e.g., body dissatisfaction, dietary restraint, drive for thinness; Cooper & Shafran, 2008; Limburg et al., 2017). Two domains of perfectionism, perfectionistic strivings and perfectionistic concerns, are of particular interest for their significant association with anorexia nervosa and bulimia

nervosa as well as individual symptoms of disordered eating (Limburg et al., 2017; Stackpole et al., 2023). Perfectionism has been suggested to contribute to the development and maintenance of EDs through excessively high standards and high self-criticism being applied in the context of weight and shape concern. Perfectionism was chosen as the point of intervention as it is considered a core maintenance factor and a key variable addressed in cognitive behavioural therapy for EDs (Fairburn, 2008; Shafran & Mansell, 2001). Perfectionism has been widely demonstrated to be susceptible to intervention and, when targeted, is effective in reducing ED symptoms as well as symptoms of depression, anxiety, self-criticism, and OCD (Galloway et al., 2022; Handley et al., 2015; Lloyd et al., 2015; Robinson & Wade, 2021). Offering treatment for a risk and maintenance factor may facilitate earlier access to treatment without young adults having to first overcome barriers associated with accessing ED treatment. By offering a perfectionism intervention online, this thesis aims to explore one possible avenue for early intervention that is widely accessible, easily disseminated, and potentially more acceptable to young adults than treatments directly addressing ED symptoms.

Aims of the Research

The overarching aim of the current research is to evaluate the efficacy, feasibility, and implementation of an online perfectionism intervention for reducing eating disorder symptomology in young adults who are considered at risk of developing an ED, identified by their endorsement of disordered eating cognitions and behaviours. The content for the perfectionism intervention was adapted from the self-help book *Overcoming Perfectionism: A self-help guide using Cognitive Behavioural Techniques* (Shafran, Egan, & Wade, 2018). Previous evaluations of this content using face-to-face and internet formats have been found to reduce perfectionism, disordered eating, and compulsive exercise, as well as improve body image concerns (Handley et al., 2015; Kothari et al., 2019; Shu et al., 2019; Valentine et al.,

2018) but none have targeted individuals who are perceived to be at risk of developing an ED (i.e. who endorse weight and shape concerns or partake in disordered eating behaviours). This thesis addresses this gap in the literature with the aim to prevent the escalation of symptoms requiring the need for more intensive treatment. Additionally, given that perfectionism interventions are used as an adjunct or complementary component of CBT in individuals where perfectionism has been identified as a maintaining mechanism (Fairburn, 2008), this thesis aims to lead to a better understanding of whether the transdiagnostic mechanism of perfectionism may be a valuable target as a stand-alone treatment outside of this current context.

The specific aims of the thesis across five studies include; to summarise the evidence for the impact of perfectionism interventions on disordered eating (**Chapter Three**), to test the feasibility and acceptability of a perfectionism intervention in young adults (**Chapter Five**), to test the efficacy of such an intervention under controlled conditions (**Chapter Six**), to test the implementation of a perfectionism intervention in a real-world setting (**Chapter Seven**), and to look at evidence and future direction for improving online intervention implementation (**Chapter Eight**). By following this stepped approach, the online perfectionism intervention created for this thesis will be tested for feasibility, acceptability, efficacy, and effectiveness. The results from this process will allow conclusions to be drawn about the value and success of this intervention and to determine whether the treatment of perfectionism has potential to be integrated as a part of routine early intervention for EDs.

Given the high association between perfectionism and ED attitudes and behaviours, it is anticipated that reducing perfectionism will result in a reduction of ED symptoms in at-risk individuals. The transdiagnostic nature of perfectionism suggests that associated comorbidities such as depression, anxiety, stress, and self-criticism may also improve with

the application of this intervention. Since the applicability of perfectionism interventions extends beyond ED cohorts, the final chapters (**Chapters Eight** and **Nine**) of this thesis consider the use of perfectionism treatment and online interventions in the broader context of general mental wellbeing.

Chapter summary

Chapter Two provides an orientation to the topics covered in this thesis via a literature review. The topics are broadly categorised into three areas: eating disorders/disordered eating, perfectionism, and online mental health interventions. Definitions, conceptualisations, prior research, and rationales for studying these areas are provided for each topic. The literature review also discusses the relationship between perfectionism and eating disorders (EDs), the current difficulties faced in accessing ED treatment, and the pitfalls of online interventions which impede their effectiveness and use.

The first study, presented **in Chapter Three,** takes a deeper dive into the topics of perfectionism and disordered eating (DE) through a systematic review and meta-analysis. The systematic review collates all published and grey literature of studies using perfectionism interventions which targeted DE or body image concerns as an outcome. The meta-analysis of eligible studies uses both a between-group and a within-group analysis of the impact of perfectionism interventions on symptoms of perfectionism, depression, anxiety, and disordered eating/body image concern. Both between- and within-group analyses were conducted to allow for ease of comparison with prior reviews covering this topic. At this time of publication, this study was the first of its kind to focus on the efficacy of perfectionism interventions at reducing symptoms of perfectionism and disordered eating and to compare the differential impact treating perfectionism has across these targeted psychopathologies.

Chapter Four presents a detailed summary of the psychometric properties for the measures used in **Chapters Five**, **Six**, and **Seven**. After ascertaining preliminary evidence for the efficacy of perfectionism interventions in reducing disordered eating and body image concern, the next study, presented in **Chapter Five**, assessed the feasibility of an internet perfectionism intervention specifically targeting a population with high body image concern or disordered eating. Rates of recruitment, retention, adherence, and indicative effect sizes were examined as markers of feasibility. The information received about feasibility, in addition to the collection of qualitative feedback, allows for modifications to be made to the recruitment, design, intervention, and analysis prior to beginning a full-scale efficacy trial and to minimise the chance of foreseeable errors occurring (Leon et al., 2011).

The aim of the efficacy trial, presented in **Chapter Six,** was to investigate if targeting perfectionism using a self-guided online intervention can reduce eating disorder symptoms in an at-risk sample of young adults. Up to this point, the available evidence had almost exclusively tested perfectionism interventions in populations characterised by elevated levels of perfectionism, rather than in populations defined by elevated levels of ED symptoms (Robinson & Wade, 2021; Steele & Wade, 2008). Additionally, no previous perfectionism trials were identified which compared the efficacy of an online perfectionism intervention against a comparable alternative perfectionism intervention. Doing so in this study allowed for an equal comparison between two perfection interventions; one offered in a static PDF format and the other in an interactive click-through format. This study provides novel evidence about what benefits may be achieved by offering a perfectionism intervention in an online multimedia format.

Once the efficacy of the online perfectionism intervention was tested in a controlled research setting, the next stage of development was to investigate its effectiveness in a

naturalistic setting. **Chapter Seven** examines the implementation of the intervention in a real-world tertiary education context and evaluates the implementation process using the RE-AIM framework (Glasgow et al., 1999). The evaluation framework will highlight some of the successes and challenges of conducting implementation on an individual and organisational level. This evaluation will be used as the basis to provide recommendations for future implementation projects, to address foreseeable errors, and increase the likelihood of sustainable implementation.

The final study, Chapter Eight, provides an exploration of methods to address the challenges of reach and uptake of online mental health interventions. This review steps away from perfectionism as the focal point and looks at the broader context of initiatives which have been used to enhance dissemination in all areas of mental health. The purpose of the scoping review is to collect and consider the current ideas which may be applied to future iterations of the perfectionism intervention and to highlight the gaps in what is currently known about ways to effectively increase the dissemination of online interventions. Chapter Nine integrates the findings, addresses the relevancy of the findings in reference to the original thesis aims, and provides future recommendations in the relevant research fields. All data collection was performed ab initio and conducted for the purpose of this thesis. The author of this thesis was involved in the collection and analyses of all datasets, except for the implementation trial (Chapter Seven) where data collection occurred overseas and access to the dataset was provided at the cessation of the intervention period. This thesis' author was responsible for selecting and creating the online battery of measures used in the implementation trial (Chapter Seven).Reader Navigation

All five studies presented in this thesis were originally prepared as journal manuscripts. Two of the studies, described in **Chapters Three** and **Six**, have been published

and the scoping review in **Chapter Eight** has yet to be submitted for publication. The second and fourth study, presented in **Chapter Five** underwent the peer review process but are yet to be accepted for publication. **Chapter Seven** was accepted for publication after the original submission of this thesis. Changes to the manuscripts from the review process were nevertheless implemented and make up part of the final chapters. The published manuscripts are similar but differ from the included chapters by condensing sections of the introductions and discussions. Particularly, background information was moved from manuscript introductions into the literature review, presented in **Chapter Two**, and future implications were moved from manuscript discussions into the general discussion, presented in **Chapter Nine**. Details of the published manuscripts are provided on the chapter title pages where relevant. Tables and Figures are provided in-text and presented where first referenced. A complete reference list is provided at the end of the thesis text, followed by an **Appendices** including copies of the published manuscripts.

CHAPTER TWO: LITERATURE REVIEW[1]

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The first study which forms part of this chapter is detailed below and can be found in **Appendix A**. First author contributed 20% to the research design, 80% to data collection and analysis, and 80% to the writing and editing. Second author contributed 80% to the research design, 20% to data collection and analysis, and 20% to the writing and editing.

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Eating Disorders

Description

Eating disorders (EDs) are characterised by disturbed attitudes towards body shape, weight, and food intake (Treasure et al., 2020). The Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition, Text Revision (DSM-5-TR; American Psychiatric Association, 2022) presents the diagnostic criteria of six main feeding and eating disorders: anorexia nervosa, bulimia nervosa, binge eating disorder, restrictive food intake disorder, pica, and rumination disorder, as well as two additional categories of other specified feeding or eating disorder (OSFED) and unspecified feeding and eating disorder (UFED). This thesis will focus on three of these EDs (anorexia nervosa, bulimia nervosa, and binge eating disorder) and the residual category of OSFED. This thesis will also cover the concept of disordered eating which is independent of any diagnostic category but pertains to the elevated levels of disturbed attitudes and eating behaviours of individuals who experience, or are at risk of developing, an ED.

Anorexia Nervosa

Anorexia nervosa (AN) is a complex mental illness with significant psychological and medical complications, characterised by an intense fear of weight gain, significantly low weight, disturbed body image, and unhealthy weight loss practices (Becker et al., 2021; Treasure et al., 2020). For a diagnosis of AN to be met, the following criteria from the DSM-5-TR (2022) must apply:

A. Restriction of energy intake relative to requirements, leading to a significantly low body weight in the context of age, sex, developmental trajectory, and physical health.

Significantly low weight is defined as a weight that is less than minimally normal or, for children and adolescents, less than that minimally expected.

B. Intense fear of gaining weight or of becoming fat, or persistent behaviour that interferes with weight gain, even though at a significantly low weight.

C. Disturbance in the way in which one's body weight or shape is experienced, undue influence of body weight or shape on self-evaluation, or persistent lack of recognition of the seriousness of the current low body weight.

The DSM distinguishes severity of illness by body mass index (BMI) in adults or BMI percentile for children and adolescents. Severity ratings are Mild (BMI ≥ 17 kg/m^2), Moderate (BMI ≥ 16-16.99 kg/m^2), Severe (BMI ≥ 15-15.99 kg/m^2), and Extreme (BMI > 15 kg/m^2). Specifiers are also used to determine whether the illness presentation is of a Restricting or Binge-eating/purging subtype. Restricting subtype is where the individual does not engage in recurrent episodes of bingeing and compensatory behaviours (purging, laxative misuse, or enemas) and weight loss is mainly a result of food intake restriction and caloric expenditure. Binge-eating/purging subtype is whereby the individual engages in recurrent episodes of bingeing and compensatory behaviour (purging, laxative misuse, or enemas). An individual with the diagnosis of AN may also be considered in remission if either part (partial remission) or all (full remission) of the criteria has not been met for a sustained period.

Bulimia Nervosa

Bulimia nervosa (BN) is characterised by recurrent periods of uncontrolled eating (binge eating) followed by compensatory behaviours (e.g., exercise, laxative use, vomiting, dietary restriction) to prevent weight gain (Becker et al., 2021; Treasure et al., 2020). For a diagnosis of BN to be met, the following criteria from the DSM-5-TR (2022) must apply:

A. Recurrent episodes of binge eating. An episode of binge eating is characterized by both of the following:

1. Eating, in a discrete period of time (e.g., within any 2-hour period), an amount of food that is definitely larger than what most individuals would eat in a similar period of time under similar circumstances.

2. A sense of lack of control over eating during the episode (e.g., a feeling that one cannot stop eating or control what or how much one is eating).

B. Recurrent inappropriate compensatory behaviours in order to prevent weight gain, such as self-induced vomiting; misuse of laxatives, diuretics, or other medications; fasting; or excessive exercise.

C. The binge eating and inappropriate compensatory behaviours both occur, on average, at least once a week for 3 months.

D. Self-evaluation is unduly influenced by body shape and weight.

E. The disturbance does not occur exclusively during episodes of anorexia nervosa.

Binge eating is defined as a discrete time period in which excessive food consumption occurs, accompanied by a loss of control and usually continuing past the point where the individual is uncomfortably or painfully full. The DSM classifies severity of illness as follows: Mild (1-3 instances of compensation per week), Moderate (4-7 episodes of compensation per week), Severe (8-13 episodes of compensation per week), and Extreme (≥14 episodes of compensation per week). An individual with the diagnosis of BN may also be considered in remission if either part (partial remission) or all (full remission) of the criteria has not been met for a sustained period.

Binge Eating Disorder

Binge eating disorder (BED) is a disorder whereby the individual engages in distressing, and often secretive, periods of binge eating. BED shares some common disorder characteristics as BN but is distinctly different due to the lack of inappropriate compensatory behaviours intended to prevent weight gain. BED commonly occurs in overweight and obese individuals, although it can occur in those in the normal weight range. BED is associated with higher severity of psychopathological symptoms (i.e., mood, anxiety, and sleep disorders) and greater functional impairment than weight-matched peers without the disorder (American Psychiatric Association, 2022; McCuen-Wurst et al., 2018). For a diagnosis of BED to be met, the following criteria from the DSM-5-TR (2022) must apply:

A. Recurrent episodes of binge eating. An episode of binge eating is characterised by both of the following:

1. Eating, in a discrete period of time (e.g., within any 2-hour period), an amount of food that is definitely larger than what most people would eat in a similar period of time under similar circumstances.

2. A sense of lack of control overeating during the episode (e.g., a feeling that one cannot stop eating or control what or how much one is eating).

B. The binge-eating episodes are associated with three (or more) of the following:

1. Eating much more rapidly than normal.

2. Eating until feeling uncomfortably full.

3. Eating large amounts of food when not feeling physically hungry.

4. Eating alone because of feeling embarrassed by how much one is eating.

5. Feeling disgusted with oneself, depressed, or very guilty afterward.

C. Marked distress regarding binge eating is present.

D. The binge eating occurs, on average, at least once a week for 3 months.

E. The binge eating is not associated with the recurrent use of inappropriate compensatory behaviour as in bulimia nervosa and does not occur exclusively during the course of bulimia nervosa or anorexia nervosa.

The DSM classifies severity of illness based on the frequency of binge episodes: Mild (1–3 binge-eating episodes per week), Moderate (4-7 binge-eating episodes per week), Severe (8-13 binge-eating episodes per week), and Extreme ($\geq$14 e binge-eating episodes per week). An individual with the diagnosis of BED may also be considered in remission if either part (partial remission) or all (full remission) of the criteria has not been met for a sustained period. The three EDs described so far are considered mutually exclusive and only diagnosis can be applicable at a time. It should be noted that research has demonstrated limited support for the DSM severity classifications (Smith et al., 2017) and further work is needed to validate such a classification scheme.

Other Feeding and Eating Disorders

The DSM 5 includes feeding or eating disturbances not encompassed by any of the aforementioned diagnostic categories; this includes other specified feeding or eating disorder (OSFED) and unspecified feeding or eating disorder (UFED). The terms are used to capture residual cases where feeding or eating disturbances are causing significant distress or functional impairment but do not meet the diagnostic criteria of any specific ED.

Presentations considered under the OSFED category include atypical (non-underweight) anorexia nervosa, bulimia nervosa of low frequency or limited duration, binge eating disorder of low frequency or limited duration, purging disorder, and night eating syndrome. A diagnosis of UFED may be given in instances where insufficient information is available to confer a diagnosis for a feeding or eating disorder, or the reason for a specific full criteria not being met is not provided.

Current DSM-5-TR diagnostic categories have been criticised for their failure to capture a large proportion ED presentations leading to a high prevalence rate of OSFED and UFED as the 'catch-all' terminology (Fairburn & Cooper, 2011; Mitchison et al., 2020). These residual categories lack specificity in their descriptions and are heterogenous in their presentations. This lack of specificity limits the clinical utility of these residual categories as they provide limited recognition of symptoms and limited guidance for treatment planning. OSFED is associated with greater eating pathology compared to AN and greater physical health impairments than BN (Wilkop et al., 2023) and thus the DSM-5-TR fails to differentiate between residual and major ED diagnoses in a way that accurately describes clinical impairment or clinical significance.

Disordered Eating

Disordered eating (DE) closely mimics the characteristics of an ED without meeting the full diagnostic criteria by occurring at a lower frequency, duration, or intensity than is warranted for a diagnosis. DE is typically defined as a global ED psychopathology, measured using the Eating Disorder Examination (Fairburn & Beglin, 2008; Fairburn et al., 2008), which encompasses a range of cognitions and behaviours that can occur across all ED categories (Pennesi & Wade, 2016). DE is characterised by abnormal eating patterns such as fad dieting, food rituals, chaotic eating, emotional eating, avoiding food groups, and food

preoccupation (Welch et al., 2009). DE can also include behaviours to control weight and shape (e.g., driven exercise, purging, using diet pills, laxative misuse). Although not recognised in the DSM-5-TR, DE behaviour may also cause psychosocial impairment and distress. Engaging in DE increases the likelihood of developing an ED over a three-year period (Forman-Hoffman, 2004; Patton et al., 1999). DE is also likely to be associated with comorbidity and high levels of impairment (Robinson et al., 2021). As DE is a pre-cursor for the development of an ED this becomes an important target for early intervention.

Prevalence

The prevalence of diagnostic ED and DE are demonstrated to be highest amongst adolescents with older age, being female, and having a higher BMI (López-Gil et al., 2023; Mitchison et al., 2020). Age of ED diagnosis is typically before the age of 25 with highest rates observed in adolescence for AN and BN, early twenties for BED, and mid-twenties for OSFED (Hay et al., 2023; Phillipou et al., 2023; Santomauro et al., 2021). Further evidence suggests the age of onset for restrictive EDs is becoming younger over time in developed countries such as the UK, Canada, and Australia (Hay et al., 2023; Madden et al., 2009; Nicholls et al., 2011; Pinhas et al., 2011). Globally, the lifetime prevalence of an ED in women is 0.8-6.3% for AN, 0.8-2.6% for BN, 0.6-6.1% for BED, 0.6-11.5% for OSFED. The lifetime prevalence of an ED in men is 0.1-0.3% for AN, 0.1-0.16% for BN, 0.2-1.2% for BED, 0.16-0.3% for OSFED (Silén & Keski-Rahkonen, 2022; Smink et al., 2013). The point prevalence of any ED for Australian adolescents is 22.2% (33% in females, 12.8% in males) with OSFED accounting for 11.2% of diagnoses and UFED accounting for a further 4% (Mitchison et al., 2020). Prevalence rates of DE are similar in Australian adolescents (41% in females, 34% in males; Sparti et al., 2019) compared with global estimates (24-30% in females, 16% in males; Hautala et al., 2008; López-Gil et al., 2023).

A global increase in the prevalence of EDs and worsening of ED symptoms was observed during the COVID-19 pandemic (Gao et al., 2022; Geddes et al., 2022; McLean et al., 2022; Phillipou et al., 2021; Zipfel et al., 2022). Young adults, gender diverse individuals, and individuals already diagnosed with an ED were recognised as some of the most vulnerable groups to the impact of the pandemic, with an increased number of hospital admissions and readmissions seen in this demographic (Chadi et al., 2021; Matthews et al., 2021; McLean et al., 2022). Rate of diagnosis for AN in adolescent females increased 15.3% in the USA during the first year of the pandemic (Taquet, 2022). Compared with those diagnosed in the three years prior to the pandemic, new presentations had significantly higher suicidal ideation and were at higher risk of attempting suicide (Taquet, 2022). Similarly, rates of DE have been robustly indicated to have increased during the COVID pandemic in community and non-clinical samples, including instances of binge eating, weight and shape concerns, and uncontrolled eating (Hansen & Menkes, 2021; McLean et al., 2022; Phillipou et al., 2021).

Impact

EDs are associated with high psychiatric and medical comorbidities, significantly impaired quality of life both physically and psychologically (Wade et al., 2012), and has one of the highest mortality rates of any psychiatric condition (Chesney et al., 2014). As well as substantially impairing physical and mental health, EDs impair psychosocial functioning (Treasure et al., 2020; Zipfel et al., 2022). Medical complications include disruptions to the cardiovascular, gastrointestinal, and endocrine systems. In individuals with BED the lifetime prevalence of obesity has been estimated at 87% (Miskovic-Wheatley et al., 2023). Co-occurring BED and obesity pose significant risk of medical and psychological complications. Medical consequences include diabetes, weight related diseases, certain cancers, and

cardiovascular complications. The presence of binge eating in individuals with obesity is associated with higher levels of anxiety and mood disorders, obsessive-compulsive behaviours, higher endorsement of ED attitudes and behaviours, and poorer quality of life than weight-matched peers (Da Luz et al., 2018). Conversely, severe and potentially fatal symptoms can result from starvation, malnourishment, and purging behaviours including leukopenia, metabolic disturbances, bradycardia, electrolyte imbalance, cardiomyopathy, oesophageal tears, cerebral atrophy, and cardiac failure (Becker et al., 2021). Menstrual irregularity and amenorrhea are also common symptoms in females with AN and BN due to nutritional deficiencies and physiological disturbances. Bidirectional associations have been established between EDs and diabetes which hold increased risk of complications and premature death if insulin misuse occurs (Treasure et al., 2020). Compared to age-matched peers, all-causes mortality rates are five times higher in individuals who have received hospitalisation for an ED (Iwajomo et al., 2021). Similarly, suicidal ideation and suicide attempts increase in prevalence five-fold in individuals with EDs compared to age-matched peers (Keski-Rahkonen & Mustelin, 2016).

Treatment of Eating Disorders

The following table summarises the recommendations provided in the NICE guidelines [NG69] *Eating disorders: recognition and treatment* (2020). Recommendations are provided for the most effective treatments for AN, BN, and BED in adults and adolescents. No specific treatment options are provided for OSFED, however, the guidelines recommend that the treatment used should be taken from the options of the disorder the OSFED most closely resembles. Medication is not recommended as a sole treatment option for any ED.

Table 1

A Summary of Evidence-Based ED Treatments Recommended by the National Institute for Health and Care Excellence

Treatment	Recommended for	Focus	Duration
Eating disorder focused cognitive behavioural therapy (CBT-ED)	AN in adults and adolescents	Weight restoration, psychoeducation, healthy eating habits, mood regulation and social skills, body image concerns, cognitive restructuring, and relapse prevention	40 sessions over 40 weeks (8-12 additional sessions for caregivers if appropriate with adolescent clients)
Maudsley Anorexia Nervosa Treatment for Adults (MANTRA)	AN in adults	Presented in a workbook format and encourages behavioural change, developing a non-AN identify, motivation, and symptom management	20 sessions, weekly for the first 10 sessions – more sessions can be added for lower BMI.
Specialist supported clinical management (SSCM)	AN in adults	Identifying and regularly reviewing key ED issues, encouraging weight restoration, nutritional advice, and physical monitoring. Attention given to issues client wants to discuss - not necessarily psychotherapy.	>20 sessions, depending on symptom severity
ED-focused focal psychodynamic therapy (FPT)	AN in adults	Pro-AN and ego-syntonic beliefs, what AN means to the client, and how symptoms influence the client's interpersonal relationships	40 sessions over 40 weeks
AN-focused family therapy (FT-AN)	AN in adolescents	Role of the family in aiding ED recovery, meal support and planning, psychoeducation, and	18-20 sessions over 12 months

		cognitive restructuring	
Adolescent-focused psychotherapy (AFP-AN)	AN in adolescents	Client's self-image, emotional and interpersonal issues, build independence, and develop alternative coping strategies	32-40 sessions over 12-18 months (8-12 additional sessions for caregivers if appropriate)
Guided self-help	BN and BED in adults and adolescents	Cognitive behavioural self-help materials are recommended with therapist guidance if appropriate	Supplementary sessions can be offered to support clients in following the self-help program
CBT-ED	BN and BED in adults and adolescents	Dietary and emotional factors contributing to binge eating, regular eating, dietary monitoring, cognitive restructuring, and relapse prevention	For BN: 20 sessions over 20 weeks (adults), 18 sessions over 6 months (adolescents). For BED: 16-20 sessions.
Group CBT-ED	BED in adults and adolescents	Self-monitoring eating behaviours, identifying binge eating cues, body exposure training, and relapse prevention	16 group sessions over 4 months
BN-focused family therapy (FT-BN)	BN in adolescents	Encouraging regular eating patterns, reducing compensatory behaviours, self-monitoring bulimic behaviours, relapse prevent, and sessions to cover how family support can aid the adolescent's recovery	18-20 sessions over 6 months

Note: AN- anorexia nervosa. BN- bulimia nervosa. BED- binge eating disorder.

Cognitive Behavioural Therapy for Eating Disorders

Behavioural and cognitive psychotherapies are central to the treatment of EDs, and ED focused cognitive behavioural therapy (CBT) is the only intervention recommended by the NICE guidelines for all three major ED diagnoses. CBT focuses on cognitions and behaviours which contribute to the development and maintenance of EDs and has the largest evidence base of all treatment options (Linardon et al., 2017; Russell et al., 2023). Theoretical models rarely inform the development of ED interventions; CBT enhanced (CBT-E) is one of only a handful of theoretically driven interventions which has undergone evaluation for feasibility, efficacy, and effectiveness (Pennesi & Wade, 2016). The development of CBT-E is based on the transdiagnostic cognitive behavioural theory formulated by Fairburn et al. (2003). The theory proposes the existence of core psychopathologies which are expressed in similar attitudes and behaviours across AN, BN, and OSFED. These transdiagnostic factors include dietary restraint, mood intolerance, perfectionism, interpersonal difficulties, low self-esteem, and overevaluation of weight and shape (Pennesi & Wade, 2015; Fairburn Cooper and Shafran 2003). Fairburn et al. (2003) proposes that the treatment of these transdiagnostic factors facilitates treatment for all EDs, rather than separate treatments needed for each diagnosis. Individual presentations serve to determine which of these transdiagnostic mechanisms are prevalent and therefore dictate whether subsequent treatment address only core eating psychopathologies via a focused version (dietary restraint and overevaluation of weight and shape) or additional maintaining factors via a broad version (mood intolerance, perfectionism, interpersonal difficulties, low self-esteem).

Despite the development of this theoretical and evidence-based psychotherapy, significant treatment gaps are still a major concern resulting in less than desirable rates of

recovery. Inadequate response to treatments has been observed longitudinally with remission only being achieved for between one-third to half of all ED patients (Castellini et al., 2011; Helverskov et al., 2010; Miskovic-Wheatley et al., 2023; Linardon & Wade, 2018). Poorer clinical outcomes have been consistently reported for AN diagnostic profiles and highest rates of remission are often associated with a diagnosis of BED (Hilbert et al., 2012; Miskovic-Wheatley et al., 2023). Higher rates of relapse and crossover between diagnoses are also associated with a diagnosis of AN or BN. A six year follow up study Castellini et al. (2011) found relapse rates of 26% for AN, 18% for BN, and 12% for BED; diagnostic transitioning was as high as 62% (AN to BN) for relapsed participants.

The presence of comorbidity further challenges the effectiveness of treatment. EDs are accompanied by psychiatric comorbidities in the majority (>70%) of cases with anxiety disorders (>50%), mood disorders (>40%), personality disorders (25%), deliberate self-harm (>20%), specific phobias (>15%), and substance use (>10%) being the most common co-occurring presentations (Keski-Rahkonen & Mustelin, 2016; Sansone & Sansone, 2011). Comorbidity significantly negatively predicts recovery and is associated with increased likelihood of transitioning between ED diagnoses (Castellini et al., 2011; Eielsen et al., 2021; Miskovic-Wheatley et al., 2023). In a 22- year longitudinal study, participants who achieved recovery were half as likely to have comorbid depression and five times less likely to have a substance use disorder (Keshishian et al., 2019). Similarly, participants were three-fold more likely to have an anxiety disorder at 5 year (11.3% vs 36%) and 17 year (14.% vs 51.6%) post-treatment than their recovered counterparts (Eielsen et al., 2021). Higher levels of comorbidity are associated with therapist drift from therapeutic protocol (Waller & Turner, 2016).

The high prevalence of comorbidities and low long-term success rates of ED treatment highlight the need for treatment options which address transdiagnostic factors which may serve to maintain more than one disorder and prevent sustained remission. To date, transdiagnostic treatment approaches which seek to address both the ED and comorbid conditions in tandem are in their infancy with the majority of current transdiagnostic interventions focusing on co-occurring anxiety and depression (Barlow et al., 2017; Thompson-Brenner et al., 2021; Wade et al., 2023). This relative gap in the literature leaves room to explore the use of transdiagnostic interventions as a standalone treatment and to determine whether the outcome of such interventions is at least comparable to disorder specific approaches. Further investigation is needed into whether transdiagnostic mechanisms are an appropriate point of intervention and whether these treatments can prove successful when not used in the context of an ED-specific therapy.

Treatment Access

Commonly cited barriers to help-seeking for ED treatment include stigma, shame, minimising severity of the illness, overestimation of ability to control ED behaviours, cost and time requirements, lack of knowledge or negative attitudes regarding available services (Ali et al., 2017; Butterfly Foundation, 2021). Denial has been identified as the most prominent and debilitating barrier for accessing treatment Radunz et al., 2023). Denial is said to reflect the valued goal of thinness in Western cultures that sees restricted eating and attempts to lose weight as a virtue and not a problem. This suggests the use of "side-door" approaches that do not directly tackle eating may be a pathway to early intervention.

The average time in Australia between onset of ED symptoms and accessing treatment is 5 years, but this time length triples when the individual is in a healthy or overweight BMI range (Hamilton et al., 2022). This may be partly due to the perception that

individuals with, or considered at-risk of, an ED 'look extremely thin' (32% at risk vs 22% general population; Butterfly Foundation, 2021). Stigmatisation has important implications in the treatment of EDs, both in the normalisation of DE and in the underdiagnosis of EDs by healthcare professionals for non-underweight individuals (Puhl & Suh, 2015; Radunz et al., 2023).

Those that receive help make up a small proportion of the total number affected. Less than one in four (23.2%) of people with an ED will access treatment or seek professional support (Butterfly Foundation, 2022; Hart et al., 2011). Of these, only a portion will go on to receive an evidence-based intervention (Kazdin et al., 2017; Waller, 2016). Depending on the diagnosis, only between 35% and 63% of people with an ED will seek help (Butterfly Foundation, 2022; Hart et al., 2011). Access to treatment is also lower amongst racial and ethnic minority groups than European Caucasians (Kazdin et al., 2017). Help-seeking is lower in ED compared to other mental health disorders including depression (Oakley Browne et al., 2006; Tillman & Sell, 2013).

Perfectionism

Perfectionism is a multi-faceted construct which collectively describes an individual's motivations and expectations to achieve high standards. The boundaries of what constitutes perfectionism are contended within the field, however, key components include high personal standards, excessive concern over mistakes, fear of negative evaluation, and self-criticism (Frost et al., 1990; Hewitt & Flett, 1991). Multiple schools of thought exist around how this concept is best conceptualised, measured, and treated. Two of the most prominent conceptualisations in the field, originally proposed by Hewitt and Flett (1991) and Frost et al. (1990), are identified by measurement.

Hewitt and Flett (1991) identified key dimensions as perfectionism directed at the self (self-orientated perfectionism), directed towards others (other-orientated perfectionism), and as a generalised belief or perception that others demand perfectionism (socially prescribed perfectionism). The second primary conceptualisation by Frost et al. (1990) identified the major proponent of perfectionism as a tendency for overly critical self-evaluation. The key dimensions from this proponent were excessive concern over mistakes in performance (concern over mistakes), the setting of excessively high personal standards (high standards), a sense of doubt over the quality of one's actions (doubt over action), the perception of high parental expectations, the perception of high parental criticism (parental expectations and criticism), and an overemphasis on order and organisation (organisation).

For the most parsimonious model of perfectionism, these various dimensions have been demonstrated to form two higher order factors, conferred by factorial analysis, termed perfectionistic standards (PS) and perfectionistic concerns (PC) or personal standards (PS) and evaluative concerns (EC) (Dunkley et al., 2006; Stoeber & Otto, 2006). PS encompasses high personal standards and self-orientated forms of perfectionism, which are arguably viewed as the more positive aspect of perfectionism. PC, however, is associated with concerns over mistakes, doubts about actions, and socially prescribed perfectionism, which have been argued as the more detrimental aspects (Dunkley et al., 2006; Stoeber & Otto, 2006). Additionally, clinical perfectionism has been described as the construct of most relevance to the perfectionism associated with mental health problems (Shafran et al., 2002).

Perfectionism and Self-criticism

Dunkley et al. (2006) argues that self-criticism is the most critical component of 'clinical' perfectionism and is linked with neuroticism, avoidant coping strategies, and greater distress over mistakes. Alternatively, PS is a factor which relates to setting and

adhering to high standards but is less closely related to the maintenance of perfectionistic pathologies. The importance of self-criticism is highlighted in the clinical perfectionism model, which suggests self-criticism mediates the relationship between perfectionism and adverse outcomes (Shafran et al., 2002). In a factor analysis performed by Dunkley et al. (2003) the Depressive Experiences Questionnaire (DEQ) self-criticism subscale was found to substantially overlap (.81) with Frost's Multidimensional Perfectionism Scale's (FMPS; Frost et al., 1990) concern over mistakes subscale, suggesting that the evaluative concerns may be partially accounted for by self-criticism. This claim was further supported by Dunkley et al. (2003) demonstrating the DEQ self-criticism subscale to be the primary indicator (.86) of the EC latent factor from the FMPS. In a follow-up study by Dunkley et al. (2006) a hierarchical multiple regression was used to differentiate between the predictive validity of perfectionism and self-criticism on ED symptomology. Self-criticism was reported to significantly contribute to depressive, anxious, and ED symptoms whereas perfectionism failed to make a statistically significant contribution once self-criticism was controlled for. This model, however, was tested solely on a binge eating disorder population and failed to address whether the effects of self-criticism hold true across other EDs including anorexia nervosa and bulimia nervosa.

Perfectionism as an Adaptive or Maladaptive Trait

Due to its heterogenous nature, perfectionism has been described as both an adaptive and maladaptive trait with evidence supporting both positions depending on which features are emphasised (Bieling et al., 2004; Trumpeter et al., 2006). Evidence, however, suggests PC and PS are both associated with negative impacts on mental health, higher levels of neuroticism, and greater perceptions of stress (Enns et al., 2001; Limburg et al., 2017). Perfectionism, as a culmination of both adaptive and maladaptive traits, likely has a negative

overall impact on wellbeing. However, adaptive traits of striving for high standards can also exist independent of perfectionism (Blasberg et al., 2016; Gaudreau, 2019).

Perfectionism is associated with a plethora of negative psychological and behavioural consequences including self-criticism (Dunkley et al., 2006), selective attention towards failure (Fairburn et al., 2003), all or nothing thinking, procrastination, and the premature termination of goal striving (Shafran & Mansell, 2001). Both PS and PC are associated with negative impacts on mental health leading to the suggestion that an acceptable, functional desire to obtain difficult aspirations is conceptually different to perfectionism (Limburg et al., 2017). This latter construct has been described and defined using numerous terminologies such as: excellencism (Gaudreau, 2019), pursuit of excellence, high standards, and striving for achievement (Freeman, 2013). Striving to achieve and uphold high standards characterises the beneficial aspects previously associated with perfectionism and perfectionistic striving. These attributes, however, are argued to exist independently from perfectionism (Blasberg et al., 2016; Flett & Hewitt, 2006; Gaudreau, 2019) and without the psychological distress typical in perfectionistic individuals.

Perfectionism becomes clinically relevant when an individual's motivation shifts from the fulfilling pursuit of high standards and excellence to the pursuit of perfectionistic standards despite adverse consequences in other psychosocial areas (Shafran et al., 2002). These self-imposed standards are designed to be progressively more demanding to the point of being almost unachievable for the person who sets them. Unrealistically high standards, when accompanied with a self-worth that is contingent upon successful outcomes and a dichotomous thinking style, almost invariably result in critical self-evaluation and the individual perceiving themselves as a failure when standards are not met. Emerging evidence suggests that working to achieve high (as opposed to perfectionistic) standards exists

separately from perfectionism and is not considered harmful (Blasberg et al., 2016; Flett &

Hewitt, 2006; Gaudreau, 2019; Osenk et al., 2020).

Perfectionism and disordered eating

Perfectionism is a risk factor for multiple psychopathologies; elevated levels of

perfectionism are prevalent in obsessive compulsive disorder (OCD), depression, anxiety,

and EDs (Bardone-Cone & Boyd, 2007; Egan et al., 2011; Sassaroli et al., 2008; Shafran et

al., 2002; (Egan et al., 2010; Shafran et al., 2002; Shafran & Mansell, 2001). Perfectionism is

a proposed risk factor both in the development and maintenance of EDs as it precedes

disorder onset and is present throughout the disorder and early stages of recovery (Bardone-

Cone et al., 2010). Multiple measures of perfectionism have been shown to significantly

correlate with DE behaviours, indicating different perfectionism constructs may uniquely

predict different DE habits (Limburg et al., 2017; Welch et al., 2009). In the context of EDs,

Fairburn et al. (2003) identified perfectionism as one of four key maintaining factors which

are relevant across ED subgroups. These four maintaining factors act in conjunction with the

core psychopathology described previously. Perfectionism may have a marked impact on ED

maintenance through its association with goal attainment in the areas of eating, shape, and

weight (Fairburn et al., 2003). Two components of perfectionism, perfectionistic standards,

and fear of failure, interact with the individual's desire to control shape and weight which

serve to maintain the ED. The result of failing to meet excessively high standards, or the

selective attention employed when a standard is met, results in a negative self-evaluation

which reinforces the need to meet perfectionistic standards in the future. This cycle may

serve to reinforce the perceived need for achievement within the ED, encouraging further

escalation of DE behaviours. Perfectionism offers a prime target for ED interventions,

particularly for at-risk populations who experience DE without meeting the criteria for a clinical diagnosis.

Interventions for Perfectionism

Two meta-analyses have so far investigated the impact of perfectionism interventions on various psychopathologies. Suh et al. (2019) examined depression and anxiety symptoms, incorporating ten studies which utilised face-to-face and online interventions to target perfectionism. Eight of the studies targeted a population with elevated perfectionism, one study targeted individuals with an ED diagnosis, and one targeted elevated perfectionism and a diagnosis of OCD. Their analysis focused solely on the comparison of intervention groups to control groups (between-group analysis) to provide estimates of the efficacy of perfectionism interventions in reducing symptoms of perfectionism, depression, and anxiety. Effect size estimates indicate both perfectionistic strivings (g= -0.48, 95% CI: -0.71, -0.25) and perfectionistic concerns (g= -0.55, 95% CI: -0.83, -0.26) are responsive to interventions as are symptoms of depression (g= -0.62, 95% CI :-1.04, -0.20) and anxiety (g= -0.49, 95% CI: -0.74, -0.24).

These findings are congruent with an earlier meta-analysis performed by Lloyd et al. (2015) which was conducted using pre-post results (within-group analysis) only. They noted a moderate reduction in anxiety (g= 0.52, 95% CI: 0.23, 0.81) and depression (g = 0.64, 95% CI: 0.35, 0.92), and a large reduction in perfectionism (concern over mistakes g= 1.32, 95% CI: 1.02, 1.64, personal standards g= 0.79, 95% CI: 0.44, 1.12, self-oriented perfectionism g= 0.81, 95% CI: 0.41, 1.20). ED symptoms were also partly investigated; one study was included that addressed the use of perfectionism interventions to reduce DE (Steele & Wade, 2008), in individuals with a diagnosis of Bulimia Nervosa. Reductions in objective binge

episodes (g= 0.32), purging (g= 0.50), and shape and weight concerns (g= 3.96) were observed post-intervention

Both Lloyd et al. (2015) and Suh et al (2019) investigated the reduction of perfectionism across multiple measures. Lloyd et al divided perfectionism into various components based on the assessment tool used (concern over mistakes, doubts abouts actions, self-orientated perfection, socially orientated perfectionism, personal standards), whereas Suh et al assessed perfectionism based on the two larger divisions of perfectionistic strivings and perfectionistic concerns. Both approaches showed perfectionism reduced after an intervention was applied, regardless of the component of perfectionism being assessed. This finding suggests that reducing all elements of perfectionism, regardless of whether they are categorised as adaptive or maladaptive, may be beneficial in reducing related psychological symptoms.

These reviews have so far demonstrated that perfectionism is susceptible to treatment and can be effectively targeted using cognitive behavioural therapy (CBT) in clinical and non-clinical samples, however, across the two meta-analyses only one study was included that addressed the use of perfectionism interventions to reduce DE (Steele & Wade, 2008). The generalisability of this study's conclusions is limited in so far as treatment was offered exclusively to individuals who met a diagnosis of Bulimia Nervosa and only a subset of DE symptoms were assessed. Since the publication of Lloyd et al.'s (2015) review, this field of research has grown exponentially and new evidence has emerged to refine the nature of the relationship between perfectionism and EDs (Vacca et al., 2020). Given the strong connection between these two pathologies, and the increasing interest in perfectionism as a therapeutic target within ED populations, there is a growing need to assess the efficacy of perfectionism interventions as a treatment for DE symptoms. It meets criteria for both a

transdiagnostic and "side-door" intervention that could improve outcomes in EDs and be effective as an early intervention strategy.

Populations Strategically Targeted in Early Intervention

Young Adults

Mental health issues have been exacerbated by COVID-19, with young adults being disproportionately affected by the pandemic (Mental Health Foundation, 2020; OECD, 2021). Flett and Hewitt (2020) argue that impact of COVID-19 was especially challenging for those with elevated perfectionism given the uncertainty of the pandemic would violate their need for control and limit their ability to engage in goal-directed behaviours. They suggest that people with high levels of perfectionism may be more reactive to stress and unable to cope with change due to rigid and inflexible thinking patterns. Trends indicate students are experiencing higher levels of perfectionism than previous generations. A meta-analysis by Curran and Hill (2019) demonstrates an increase in various perfectionistic constructs in 41,641 college students from America, Canada, and Britain over a 27-year span. The rise in perfectionism in college students has negatively impacted psychological wellbeing, depression, anxiety, suicidal ideation, and academic performance within this cohort (Çapan, 2010; Curran & Hill, 2019; Fernández-García et al., 2023; Flett & Hewitt, 2002). Similarly, the prevalence of depression and anxiety surged dramatically during the pandemic, with rates being 30-80% higher amongst young adults than in the general population (OECD, 2021).

Higher Education Students

Timely access to effective mental health support is a growing issue amongst higher education institutions (HEIs). Young adults (24 years old or younger) make up 90% of undergraduate enrolments at HEIs, an age when most mental illnesses first present i.e., 18-25

years (Thorley, 2017). Globally, life satisfaction has been shown to decline most rapidly between the ages of 15-24 years old with anxiety and depression being the most reported mental health concerns (Handa et al., 2023; Neves & Hewitt, 2020; Thorley, 2017).

Undergraduate students are reported to have lower levels of wellbeing than the general population for age matched peers (Thorley, 2017). Students face considerable academic, financial, and social demands whilst at university often within the context of moving away from regular social supports and living independently for the first time. Students take on greater responsibility to manage their workload, self-direct learning, and adapt to their new environments. The inability to successfully manage these transitions to higher education can significantly impact mental wellbeing and academic prospects. Poor mental health in students is associated with increased risk of academic failure, lower GPA, withdrawal from university, and suicide (Bruffaerts et al., 2018; Thorley, 2017; Zając et al., 2023). Most UK students (58%) surveyed in 2020 by the Higher Education Policy Institute indicated their mental health had worsened because of COVID-19 (Tinsley, 2020). Despite these recent trends in perfectionism and mental health difficulties, it is estimated that only 20-30% of students with a mental health concern currently access university counselling or wellbeing services (*Student Minds*, 2023). Conversely, less than half (42%) of HEI students reported feeling satisfied with the way their institution delivered mental health services in 2020, during the height of the pandemic (Hewitt, 2021).

A study by Remskar et al. (2022) conducted in the UK identified key barriers and guidelines for improving student engagement with wellbeing services on campus. Students highlighted the need for an inclusive service that offers prevention and low-intensity (brief and without formal referral) wellbeing support, rather than feeling the need to reach a threshold for acute or severe mental health issues before seeking access. Students also

expressed dissatisfaction with the level of applicability of the skills offered and their relevance to daily living. Students expressed preferences for wellbeing support to be offered widely and early in the academic year, that services offer support as prevention rather than intervention-focused, and that skills are easily applicable to day-to-day activities. Students indicated they would engage with wellbeing support if practical barriers were minimal and support options were readily accessible and well-advertised. To achieve these recommendations, a greater range of programs are needed to address the treatment gap for university students. The delivery of face-to-face counselling is resource intensive and may not be suitable for all students given the range of barriers to help seeking. Online programs offer low-intensity options that can be tailored towards improving and maintaining wellbeing. Such options would address several of the main concerns raised by Remskar et al. (2022) suggesting that students wish for improved accessibility and to access wellbeing interventions outside of periods of acute mental distress.

Online Mental Health Interventions

Systemic and individual barriers to receiving help create a treatment gap; a disparity between the number of individuals with a disorder versus those who receive treatment (Kazdin et al., 2017). The treatment gap is particularly salient in EDs due to perceived stigmatisation and ambivalence associated with these conditions (Ali et al., 2017). Therefore, it is imperative to look for ways to improve and optimise engagement within this population. Addressing the treatment gap will mean providing access on a large scale whilst circumventing as many barriers to treatment as possible. Online interventions have the potential to address part of this treatment gap and overcome many of the barriers posed by face-to-face treatments. Online mental health interventions are useful as a method of early and indicative intervention as they do not require the presence of a therapist and require

almost no consumable resources per user (Karyotaki et al., 2015). Indicative interventions attempt to maximise early detection and prevent the onset or development of an ED (Le et al., 2017; Watson et al., 2016). Indicative or targeted prevention involves identifying and treating symptoms in at-risk individuals, rather than attempting to create larger social interventions aimed at an indiscriminate audience.

On an individual level, online interventions have the benefit of being cheaper than clinician-led therapy, accessible at any time or geographical location, completed at the individual's own pace, and require minimal contact with healthcare professionals. Online treatments provide ease of access for individuals who are unwilling or unprepared to seek face-to-face help and can effectively fill the time between referral and treatment beginning for individuals who do seek help (Vollert et al., 2019). On a systemic level, online interventions reduce the burden on human resources, are scalable, easily disseminated through online platforms, can be used as an adjunct for face-to-face therapy, and standardise content delivery. As technology continues to develop and become cheaper, online interventions will benefit from the integration of features such as AI chatbots, algorithms to tailor intervention content, immediate feedback on therapy progress, and 'in the moment' prompts via smart devices. The duration, frequency, and intensity of online interventions can be calibrated to the individuals' needs without a significant increase in the demand on resources. Multimedia elements in online interventions have been suggested play a moderating role in ED treatment outcome (Barakat et al., 2019), whilst providing a more interactive intervention has been found to have lower dropout rates (Linardon et al., 2022). Online interventions have also been demonstrated to reach wider audiences and to be associated with the recruitment of significantly higher symptom severity (Bauer et al., 2019; Vollert et al., 2019).

Another possible benefit is that actual and intended help seeking behaviours may change due to engagement in online interventions. The barriers to help-seeking are particularly salient in EDs due to the perceived stigmatisation and poor mental health literacy associated with these conditions (Hepworth & Paxton, 2007). In a study by Moessner et al. (2016) young adults were given access to an online prevention program for EDs (*ProYouth*). At three-month follow-up, over half of the participants reported intentions to engage with treatment for an ED if needed. Approximately half of participants attributed their decision to their engagement in the *ProYouth* program. By improving mental health literacy and providing easy access to online care, online interventions have the potential to reduce wait time before help seeking for those who need more intensive support.

Use and Efficacy of Online Interventions

The acceptability and intended use of online interventions in an ED population has been assessed on at least three occasions. In Linardon et al. (2020) and Linardon et al. (2021) intentions to use an e-health intervention were assessed in populations with elevated ED attitudes and behaviours. Attitudes towards e-health interventions were largely positive with over half (52% and 58% respectively) of at-risk participants endorsing the use of such an intervention for addressing or preventing ED symptoms. Similarly, McClay et al. (2016) specifically assessed the attitudes of individuals with bulimic symptoms, 98% of the assessed population endorsed that an online self-guided treatment for ED would be useful. Predictors of intended e-therapy use were investigated by Linardon 2020 and included: not currently receiving psychotherapy, positive attitudes towards e-therapies, and higher perceived stigma towards professional help seeking. Support preferences were assessed in all three studies and unanimously indicate a strong preference for e-health interventions to include therapist guidance or support. McClay et al. (2016) suggested email support to be the preferred

medium (endorsed by 95% of respondents). Only around 8% of participants expressed a preference for unguided e-therapy in Linardon et al. (2020) and Linardon et al. (2021). Where reported, concerns with confidentiality, privacy, and information accuracy were rated as the main barriers to using an online intervention (Linardon et al., 2021; McClay et al., 2016).

The efficacy of online interventions is of growing interest with recent meta-analyses comparing the efficacy of digital and face-to-face programs, as well as moderators of these effects (McClure et al., 2023; Linardon et al., 2019; Melioli et al., 2016). Randomised control trials (RCTs) have been demonstrated that online interventions (both guided and unguided) improve ED symptomology when used for selective and indicative prevention and treatment. Small to moderate effects have been demonstrated for reducing shape and weight concern, body dissatisfaction, dietary restraint, thin idealisation, bulimic symptoms, and negative affect (Linardon et al., 2020; Melioli et al., 2016; Wade & Wilksch, 2018). There is some evidence to suggest that digital formats have less efficacy than face-to-face treatment (Linardon, Shatte, Messer, et al., 2020; Wade & Wilksch, 2018). In one meta-analysis, active interventions significantly outperformed online interventions for shape and weight concern (g = -0.20, 95% CI -0.33, -0.07) but was not significantly different for ED psychopathology, dietary restraint, and drive for thinness (Linardon et al., 2020). The strongest effects of online interventions appear to be for treatment trials when comparing waitlisted controls to online interventions (Linardon et al., 2020; Wade & Wilksch, 2018). Effect sizes for online interventions are smaller when compared with alternative interventions or used in universal prevention (Linardon, et al., 2020; Melioli et al., 2016). By comparing two online interventions with identical content, Linardon et al. (2022) specifically investigated the impact of an interactive versus static format on uptake, drop out, and ED symptom reduction. Drop out was reportedly higher in the static than the interactive intervention group, but no

significant differences were found between the two groups for adherence rates or ED symptom reduction. Additionally, a meta-analysis by Suh et al. (2019) investigated the moderating effects of perfectionism interventions on perfectionistic strivings and perfectionistic concerns for online and face-to-face treatments. They concluded that delivery modality (online versus in-person) did not moderate the relationship between intervention and outcome effect size. This finding should be interpreted with caution as the meta-analysis included a small sample of three online and seven face-to-face interventions. Further research is needed to determine whether online interventions may be an appropriate and effective alternative to face-to-face treatment or better utilised as part of a stepped-care approach to facilitate access to further ED treatment.

Online Intervention Engagement

The internet is a common first point of contact for individuals seeking support and information for mental health concerns, particularly amongst young adults. A survey of Canadian youths aged 17-24 years old indicated that 93% are regularly online and 83% indicated they would use the internet if experiencing psychosocial difficulties, indicating it is a key resource and point of contact for this age group (Wetterlin et al., 2014). Despite the potential advantages of online interventions, current uptake and user engagement is sup-optimal and high rates of attrition have been widely acknowledged in the literature (Ali et al., 2022; Dölemeyer et al., 2013; Linardon et al., 2021). Poorer adherence has also been found in unguided versus guided online interventions, with less time spent completing online modules in unguided programs (Kass et al., 2014). Prior research has demonstrated that offering incentives decreases study dropout rates (Abshire et al., 2017; Booker et al., 2011; Gates et al., 2009; Khadjesari et al., 2011), though there are limited investigations into the use of incentives in ED populations (Beintner et al., 2012; Beintner et al., 2014).

Maintaining participant engagement is a well-recognised difficulty when delivering online multisession intervention programs in ED populations with open trials associated with poor uptake and controlled trials achieving between 50% and 90% completion rates (Musiat et al, 2022). High rates of attrition consequently jeopardise the ability of studies to detect clinically significant change (Shafran et al., 2017; Shu et al., 2019; Wilksch et al., 2008) and reduces the effect of treatment (Wade et al., 2019). For example, only 17% of participants completed all online modules for depression when a web-based self-guided approach was used, with 59% dropping out before half the modules are completed (Karyotaki et al., 2015). There are no clear predictors of online engagement, apart from the provision of guided self-help (e.g., human support or contact) rather than pure self-help (Johnson et al., 2020). The use of guidance compared to pure self-help increases the proportion of individuals starting an intervention, the average number of modules completed, and the proportion of individuals completing the entire intervention content. A recent examination of guided self-help for BED found that 25% of participants were classified as dropouts (50% or less of the modules completed; Puls et al., 2020).

Online Intervention Uptake

Online intervention uptake can be problematic; a considerable proportion of potential users are not adopting online interventions when offered. Recent rates of online treatment uptake for depression and anxiety indicate that approximately half (Etzelmueller et al., 2020) to less than a quarter (Titov et al., 2020) of eligible research participants will start an intervention, even after screening identifies elevated symptoms. Difficulties with online intervention uptake are commonly faced in ED treatment. Even in studies with significant recruitment efforts, such as the *StudentBodies* program, 38.1% of women who met the inclusion criteria for anorexia nervosa did not want to participate after being offered

treatment (Vollert et al., 2020). Similarly, when surveyed about intentions to use a guided or unguided e-therapy program, only half (51.5%) of participants from a DE population indicated they would use this option for problems with their eating (Linardon et al., 2020). Barriers that relate specifically to online mental health interventions include concerns about the accuracy of information presented online, doubts about the effectiveness of online programs, concerns about privacy and confidentiality, and lack of knowledge about available programs (Batterham et al., 2021; Linardon et al., 2021).

Controlled trials and efficacy trials tend to portray an unrealistic image of uptake and program usage which is not reflected in real-world implementation (Baumel et al., 2019; Fleming et al., 2018; Marchand et al., 2011; Sanatkar et al., 2021). This becomes particularly problematic when the participant sample used in controlled trials are homogenous and non-representative of the target population and so little information is gathered on how to engage the target audience when interventions are publicly disseminated. It is imperative to look for ways to improve online treatment access and use within ED populations both in controlled trials and real-world implementation. Pilot trials are necessary first step to identify possible factors that will influence uptake and adherence to an online program and seeking feedback from end-users may increase engagement (Linardon et al., 2021). Improving online treatment engagement might be not so much about how to disseminate interventions more broadly, but how can dissemination be tailored and made more specific so that it reaches those who need it most or are most likely to be responsive to online interventions (Shoham & Insel, 2011). Addressing questions around engagement might involve refining the reach process rather than "shooting in the dark" (Shoham & Insel, 2011) and offering programs in a way that increases reach to a specific targeted subgroup with whom uptake could be effectively increased via targeted efforts. As the promotion of online mental health

interventions can be an expensive endeavour in terms of marketing and recruitment efforts, it is imperative that resources are directed into appropriate and prolific recruitment channels.

Conclusion

This chapter has argued that interventions for EDs need to be improved, including early intervention strategies that have potential to prevent disordered eating becoming an ED. The potential for transdiagnostic "side-door" interventions, that can circumvent denial and effectively decrease factors that maintain DE, was suggested. It has been postulated that perfectionism may be an effective early intervention as it meets all these criteria. The use of internet treatment is also a promising avenue to explore as a way of delivering these early interventions. The next chapter explores the impact of perfectionism interventions on ED, depression, and anxiety symptomology via a systematic review and meta-analysis.

CHAPTER THREE:
PERFECTIONISM INTERVENTIONS TARGETING DISORDERED EATING: SYSTEMATIC REVIEW AND META-ANALYSIS[1]

1.The study described in this chapter was published and can be found in **Appendix A**. First author contributed 20% to the research design, 80% to data collection and analysis, and 80% to the writing and editing. Second author contributed 80% to the research design, 20% to data collection and analysis, and 20% to the writing and editing.

Robinson, K., & Wade, T. D. (2021). Perfectionism interventions targeting disordered eating: A systematic review and meta-analysis. *International Journal of Eating Disorders, 54*(4), 473-487. https://doi.org/https://doi.org/10.1002/eat.23483

Abstract

A systematic review and meta-analysis were conducted of studies using perfectionism interventions that included measures of disordered eating/body image concerns. The primary aim was to investigate the impact on perfectionism and disordered eating/body image concerns, with a secondary aim of examining the impact on depression and anxiety. The systematic review was conducted using Medline, PsycINFO, and Scopus. Grey literature was sought via ProQuest Dissertations and Theses Global. Effect size estimates for the meta-analysis were calculated using between- and within-group comparisons. Eight studies were included in the between-group analysis and nine studies in the within-group analysis. Perfectionism interventions were effective in reducing perfectionism and disordered eating with large effect sizes, and in reducing depression and anxiety with moderate effect sizes. Studies included both clinical and non-clinical populations. Substantial heterogeneity was present across most analyses. Eating disorder treatments may benefit more from the inclusion of perfectionism interventions than depression and anxiety treatments. Possible reasoning for these variations between symptom reduction is discussed. This report provides important early evidence for the efficacy of perfectionism interventions, however, the limited number of publications in this area, the presence of heterogeneity, and lack of diversity in participant populations limits the generalisability of these findings. Future research is needed to determine whether eating disorder treatments may benefit from the routine inclusion of a perfectionism component.

The findings from this study build upon the suggestion from Lloyd et al. (2015) that disordered eating symptoms could be reduced in a population diagnosed with Bulimia Nervosa using a perfectionism intervention. Since Lloyd et al.'s (2015) review, the impact of perfectionism on disordered eating and body image has been examined via multiple interventions such that a reappraisal of studies is now warranted. The first aim of this research is to conduct a systematic review and meta-analysis of studies which have targeted perfectionism to ascertain effects sizes for both perfectionism and disordered eating/body image. A secondary aim was to investigate the impact of perfectionism interventions on depression and anxiety to compare the differential impact treating perfectionism has on various psychopathologies. Due to differences in study designs, both between- and within-group effect sizes are compared to utilize as much of the available evidence as possible. This study intends to identify the impact of targeting perfectionism on mental health concerns related to this transdiagnostic issue.

Method

Search Strategy

A manual literature search was conducted in August 2020 by the first author using Scopus, Medline (Ovid), and PsycINFO. The search terms (appearing in either title, abstract, subject heading, or keyword) included (perfect*) AND (treatment OR therap* OR intervention* OR prevention* OR trial* OR analysis or evaluat*) AND (anorexi* OR bulimi* OR "eating disorder*" OR "disordered eating" OR ((weight OR body) ADJUNCT TO (image OR concern OR dissatisfy*) OR dysmorph*). A grey literature search was conducted using the same search terms through the database ProQuest Dissertations and Theses Global. Additionally, attempts were made to contact the authors of the papers included in the meta-analysis to enquire about relevant unpublished or ongoing research.

Eligibility Criteria

Studies were considered eligible for systematic review if they evaluated a perfectionism intervention that included disordered eating or body image as an outcome measure, regardless of whether the format was a case series, randomized control trial, qualitative assessment, or other. The studies needed to be written in English and published in peer review journals, irrespective of whether the results published were qualitative or quantitative. Subsequent inclusion in the meta-analysis required only the studies which produced quantitative data for use in calculation of an intervention effect size, and which offered perfectionism treatment as a standalone rather than augmented treatment. All papers which did not include measures of symptom severity for both disordered eating/body image and perfectionism were excluded at the final phase of screening for the meta-analysis. Studies were excluded if they were based on a paediatric (pre-adolescent) population, did not provide multiple sessions of perfectionism treatment, or addressed perfectionism as a sub-component of a larger intervention with a multifaceted approach. Paediatric populations were excluded from this meta-analysis due to a lack of evidence supporting the reliability and validity of using perfectionism measures in this age group (Leone & Wade, 2018). Child-specific measures of perfectionism remain largely untested for construct validity and the appropriateness of using an adult conceptualisation of perfectionism in children is unknown. Further clarification is needed as to how perfectionism should be measured in children before including this population in a systematic review.

Meta-analyses

Two meta-analyses were conducted using a random effects model for the constructs of perfectionism, eating disorder behaviours, depression, and anxiety. Effect size (ES) estimates were calculated for both within-group and between-group data. Within-group

estimates compared pre- and post-trial scores in the intervention group, as reported in a previous meta-analysis of perfectionism interventions (Lloyd et al., 2015) to permit comparability to these results. The between-group estimates compared post-trial scores of the intervention group against the control group. Where values were not available or could not be calculated from the published data, the papers' authors were contacted to request the missing information. All requests were complied with, allowing for all studies to be included in the meta-analysis. One study (Johnson et al., 2019) did not use a control group and was excluded from the between-groups analysis.

The Comprehensive Meta-Analysis Program Version 3 (Borenstein, Hedges, Higgins, & Rothstein, 2013) was used to calculate all statistics relating to the meta-analysis (forest plots, heterogeneity, publication biases) excluding the correlation coefficients. Due to the small number of studies included in this analysis (n <10), Hedge's g was chosen over Cohen's d as the estimate for ES. The calculation for Hedge's g applies a correction factor (J), which is not found in the formula for Cohen's d, which allows for a less biased estimate of ES in small samples (Borenstein et al., 2013). ESs were computed using group means (M_1 and M_2), group standard deviations (SD_1 and SD_2), sample size (n_1 and n_2), and a correction for the correlation between pre- and post-measures (r).

Where studies included more than one measure of perfectionism, preference was given first to the Frost Multidimensional Perfectionism Scale- Concern over Mistakes subscale (FMPS-CM) as this measure was expected to give the most reliable representation of perfectionistic concerns and is a commonly reported measure, allowing for more reliable and accurate cross-study comparison (Bulik et al., 2005). Measures designed to assess eating disorder behaviours or body image concerns were included for the purpose of analysis as they both relate to the generalisable construct of disordered eating. Body image measures were

reported in three studies and the global Eating Disorder Examination Questionnaire (EDE-Q; Fairburn & Beglin, 2008) was used in the remaining six studies which assessed eating disorder behaviours. In studies using multiple measures of eating disorder behaviours or body image concerns, preference was given to EDE-Q as the most reported measure, allowing for reliable cross-study comparison.

Correlation Calculations for Within Group Effect Sizes

Within-group effect sizes were not reported for seven of the nine papers. To conduct a meta-analysis of the pre-post intervention effects, a correlation coefficient was calculated for each construct and applied across all nine studies. In doing so, the within-group effect sizes were calculated adjusting for the intra-individual/repeated measures effect. In order to estimate the correlations between measures, the pre-treatment and post-treatment (12-week follow-up) data from Shafran et al. (2017) was used as the basis for this analysis. Analyses were conducted using the IBM statistics software SPSS (Version 25). Estimates were obtained using linear mixed-effect models (LMM) which required fewer assumptions than repeated-measures ANOVA and accommodated for missing data using a maximisation likelihood. Correlates were estimated using an intent-to-treat analysis and included all cases where data was missing from one or more timepoints. Of the 62 participants who were randomised to treatment in Shafran et al.'s (2017) study, 31 (50%) did not complete the post-treatment measures.

Heterogeneity

Q and I^2 were calculated to determine heterogeneity; I^2 expresses the percentage of variability attributable to heterogeneity rather than sampling error. Possible values range from 0-100% with higher values representing greater heterogeneity. Measures of heterogeneity are susceptible to substantial bias when few studies are included. Hence, I^2 should be interpreted

cautiously and within the context of the meta-analysis, addressing for potential reasons for heterogeneity (von Hippel, 2015).

Publication Bias

Publication bias was assessed using Egger's test (Egger, Smith, Schneider, & Minder, 1997). Egger's test provides a Y intercept (from linear regression) which, if significantly different from zero, indicates publication bias is likely present.

Quality Assessment

All studies included in the final meta-analysis were assessed for quality using the Consort 2010 checklist for reporting a pilot or feasibility trial (Eldridge et al., 2016). As the meta-analyses comprised of case series and randomised control trials (RCTs), a subset of nine items were selected, from the original 40, which were applicable to all study types. The selected items were: (Item 4a) Eligibility criteria for participants; (Item 5) The interventions for each group with sufficient details to allow replication, including how and when they were actually administered; (Item 7a) Rationale for numbers in the pilot trial; (Item 13a) For each group, the numbers of participants who were approached and/or assessed for eligibility, randomly assigned, received intended treatment, and were assessed for each objective; (Item 13b) For each group, losses and exclusions after randomisation, together with reasons; (Item 15) A table showing baseline demographic and clinical characteristics for each group; (Item 16) For each objective, number of participants (denominator) included in each analysis. If relevant, these numbers should be by randomised group; (Item 17) For each objective, results including expressions of uncertainty (such as 95% confidence interval) for any estimates. If relevant, these results should be by randomised group; (Item 26) Ethical approval or approval by research review committee, confirmed with reference number. The checklist was applied

using a coded response with items given a 'Y' if criteria was met, an 'N' if criteria was not met, and a 'P' if criteria was partially fulfilled.

Additionally, a second quality assessment tool was used to specifically assess the quality of RCTs included in the meta-analysis. The Cochrane Risk of Bias (II) tool assesses individually randomised, parallel group trials, and provides a rating to differentiate those of 'Low' versus 'High' or 'Some' concern for risk of bias (Higgins et al., 2011). All items from the Cochrane Risk of Bias tool were included.

Results

Systematic Review

As shown in **Figure 1**, the search identified 881 studies with 28 studies identified as potentially relevant. From the grey literature search, one additional unpublished study (currently under review for publication) was provided by a contacted author. Fifteen studies were included for systematic review and the study characteristics summarised in **Table 1a**. Studies within this broader category were published between 2008-2020 and included eight randomised trials, five case series, one qualitative assessment, and one non-randomised controlled comparison. Self-guided treatments accounted for one-third (n= 5) of the programs whilst two-thirds (n=10) were guided by a clinician or researcher. All studies (where specified) provided cognitive behavioural therapy as the basis of the intervention. The primary outcomes clustered around symptom reduction (ED: n= 4, perfectionism: n= 6, ED and perfectionism: n= 1) and intervention feasibility (n= 4). Participants were recruited from ED outpatient services (n = 3), ED inpatient services (n = 3), and non-clinical settings (n= 9). Nine interventions were conducted face to face and six used an online format.

Figure 1

PRISMA flow diagram
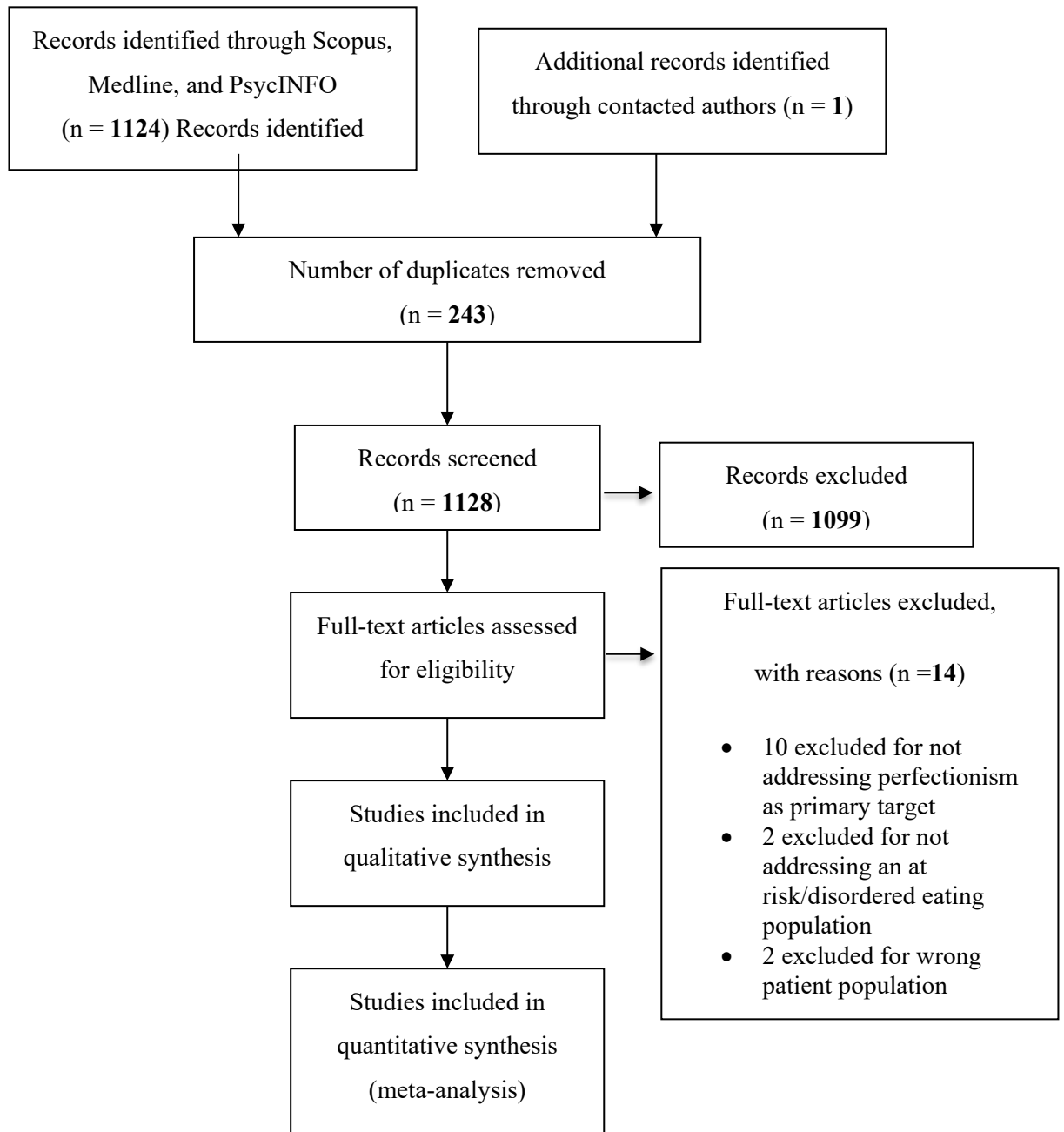
Table 1a

Study Characteristics for All Studies Identified Which Contain Perfectionism Interventions Targeting Body Image Concerns and Disordered Eating.

Study	Design	Treatment	Treatment modality	Target Demographic Primary Diagnosis	Treatment group N	Control N	N sessions	Perfectionism measures	Disordered eating measures	Body image measures	Depression measures	Anxiety measures	Primary Outcome
Grieve, Egan, Andersson, Carlbring, Shafran, Wade, 2020 [M]	RCT	CBT	Online self-guided	Self-identified perfectionism	41	48	8	FMPS, Almost Perfect Scale (Revised)	N/A	Body Image Acceptance and Action Questionnaire	DASS-21 (depression subscale)	DASS-21 (anxiety subscale)	Perfectionism symptom reduction
Goldstein, Peters, Thornton, Touyz, 2014 [A]	RCT	CBT	Face to face group therapy	ED (ED service outpatients)	28	29	7	FMPS, MPS-H	EDE-Q	N/A	N/A	N/A	ED symptom reduction
Handley, Egan, Kane, Rees, 2015 [M]	RCT	CBT	Face to face group therapy	Elevated perfectionism	21	21	8	FMPS, CPQ, DAS (self-criticism subscale)	EDE-Q	N/A	BDI-II	DASS-21 (anxiety subscale)	Perfectionism symptom reduction
Hurst, Zimmer-Gembeck, 2015 [A]	Case series	FBT + CBT	Face to face single cohort	Anorexia Nervosa	3	N/A	9	Child & Adolescent Perfectionism Scale	EDE	N/A	N/A	N/A	ED symptom reduction

Author, Year	Study design	Treatment	Delivery	Population	N	N2	Sessions	Measure 1	Measure 2	Measure 3	Measure 4	Measure 5	Outcome
Johnson, Egan, Andersson, Carlbring, Shafran, Wade, 2019 [M]	Case series	CBT	Online self-guided	Dysmorphic concern	31	N/A	8	FMPS	N/A	Dysmorphic Concern Questionnaire, Multidimensional Body-Self Relations Questionnaire	DASS-21 (depression subscale)	DASS-21 (anxiety subscale)	Perfectionism symptom reduction
Kothari, Barker, Pistrang, Rozental, Egan, Wade, Allcott-Watson, Andersson, Shafran, 2019 [M]	RCT	CBT	Online guided	Elevated perfectionism	62	58	8	FMPS, CPQ	EDE-Q	N/A	DASS-21 (depression subscale)	DASS-21 (anxiety subscale)	Perfectionism symptom reduction
Larsson, Lloyd, Westwood, Tchanturia, 2018 [Q]	Qualitative assessment	U	Face to face group therapy	Anorexia Nervosa (ED service inpatients)	14	N/A	6	N/A	N/A	N/A	N/A	N/A	Thematic Analysis
Levinson, Brosof, Vanzhula, Bumberry,	Case series	CBT	Face to face	ED (unspecified; inpatients and outpatients)	28	N/A	7	FMPS	EDI-II (Drive for Thinness and Bulimia	EDI-II (Body Dissatisfaction subscale)	N/A	The Social Appearance	Intervention feasibility

Zerwas, Bulik, 2017 [A]			group therapy						Symptoms subscale)			Anxiety Scale	
Lloyd, Fleming, Schmidt, Tchanturia, 2014 [A]	Case series	CBT	Face to face group therapy	Anorexia Nervosa (ED service inpatients)	42	N/A	6	FMPS	EDE-Q	N/A	N/A	N/A	Intervention feasibility
Shu, Watson, Anderson, Wade, Kane, Egan, 2019 [M]	RCT	CBT	Online self-guided	Self-identified perfectionism	36	24	8	CPQ	EDE-Q	N/A	Revised child anxiety and depression scales	Revised child anxiety and depression scales	Perfectionism and ED symptom reduction
Steele, Wade, 2008 [M]	RCT	CBT	Face to face guided self-help	Disordered eating (modified DSM-5 criteria for BN)	15	N/A	8	FMPS	EDE-I and EDE-Q	N/A	DASS (depression subscale)	DASS (anxiety subscale)	ED symptom reduction
Tchanturia, Larsson, Adamson, 2016 [A]	Case series	U	Face to face group therapy	Anorexia Nervosa (ED service inpatients)	47	N/A	6	FMPS, CPQ	N/A	N/A	N/A	N/A	Intervention evaluation
Valentine, Bodill, Watson, Hagger,	RCT	CBT	Online self-guided	Elevated perfectionism	38	29	8	FMPS, CPQ	EDE-Q	N/A	N/A	N/A	Perfectionism symptom reduction

Anderson, Egan, 2018 [M]													
Wade, Kay, de Valle, Egan, Andersson, Carlbring, Shafran, 2019 [M]	Randomised trial	CBT	Online self-guided	Perfectionistic concerns (non-clinical)	28	23	8	FMPS	N/A	Body Image Acceptance and Action Questionnaire	DASS-21	DASS-21	Perfectionism symptom reduction
Wilksch, Durbridge, Wade, 2008 [M]	Controlled Comparison	U	Face to face classroom based	N/A	51	44	8	FMPS	EDE-Q, Dutch Eating Behaviour Questionnaire	N/A	N/A	N/A	ED symptom reduction

Note: Q- Qualitative data only. A- Augmented or concurrent treatment. M- Eligible for meta-analysis. N sessions- Number of sessions. RCT- Randomised control trial. U- Unspecified treatment type. EDE-Q – Eating Disorder Examination- Questionnaire. EDE-I – Eating Disorder Examination- Interview. DASS-21 – Depression Anxiety Stress Scale. BDI- Beck Depression Inventory.

Meta Analyses

Nine of the fifteen studies were selected for the meta-analysis. Five studies were excluded for offering augmented or concurrent treatment and one qualitative study was excluded. The final selection included one case series, one non-randomised controlled comparison, and seven randomised trials.

Study Characteristics

Demographic information is provided in **Table 1b,** and studies included in the meta-analysis are represented with an asterisk. Across the nine studies 720 participants were included (88.6% female sample) with the mean age of participants ranging from 15-37 years old (total mean age= 24.9 years). More than half the studies recruited through secondary or tertiary educational institutes, resulting in a 48.9% (n = 352) student participant population. Information was not routinely reported regarding marital status (n = 2), socioeconomic status (n = 1), and ethnicity (n = 4). Where this information was provided, participants were majority Caucasian (44-77%) and single (58-73%).

Table 1b

Demographic Information for Each Study Included in the Systematic Review

Study	Total sample size	Age (SD)	N females	Occupation	Ethnicity	Marital Status	SES
*Grieve, Egan, Andersson, Carlbring, Shafran, Wade, 2020	114	24.7 (8.4)	102 (89.5%)	Tertiary students (n= 114)	Asian (n=28, 24.6%), Australian (n= 71, 62.3%), Other (n= 15, 12.2%)	U	U
Goldstein, Peters, Thornton, Touyz, 2014	57	23.4 (7.1)	56 (98.2%)	U	U	U	U
*Handley, Egan, Kane, Rees, 2015	42	28.9 (8.3)	34 (81%)	Student (n= 22), Employed (n= 20)	U	U	U
Hurst, Zimmer-Gembeck, 2015	3	16.7 (1)	3 (100%)	U	U	U	U
*Johnson, Egan, Andersson, Carlbring, Shafran, Wade, 2019	31	22.1 (5.5)	28 (90.3%)	U	Caucasian (n= 24, 77%), Asian (n=3, 10%), Other (n= 4, 13%)	U	U
*Kothari, Barker, Pistrang, Rozental, Egan, Wade, Allcott-	120	28.9 (7.9)	98 (81.7%)	Tertiary students (n= 62), Vocational certificate	White British (n= 52, 44%), Other (n= 66, 56%)	Single (n= 88, 73%), Married (n= 27,	U

Study	N						
Watson, Andersson, Shafran, 2019				trained (n= 57)		22.5%), Divorced (n= 5, 4%)	
Larsson, Lloyd, Westwood, Tchanturia, 2018	14	27.4 (7.7)	14 (100%)	U	U	U	U
Levinson, Brosof, Vanzhula, Bumberry, Zerwas, Bulik, 2017	28	26.8 (12.6)	U	U	European-American (n= 20, 71%)	U	U
Lloyd, Fleming, Schmidt, Tchanturia, 2014	21	22 (U)	U	U	U	U	U
*Shu, Watson, Anderson, Wade, Kane, Egan, 2019	94	16.2 (1.8)	94 (100%)	U	U	U	U
*Steele, Wade, 2008	48	24.7 (5.5)	47 (97.9%)	Tertiary student (n= 16), Employed (n= 31)	U	Single (n= 28, 58.3%)	U
Tchanturia, Larsson, Adamson, 2016	35	U	U	U	U	U	U

*Valentine, Bodill, Watson, Hagger, Anderson, Egan, 2018	67	37 (12)	41 (61.2%)	U	U	U	U
*Wade, Kay, de Valle, Egan, Andersson, Carlbring, Shafran, 2019	66	26.7 (9.6)	56 (85.5%)	U	U	U	U
*Wilksch, Durbridge, Wade, 2008	138	15 (0.4)	138 (100%)	High school students (n= 138)	U	N/A	Middle income (private and public schools assessed)

Note: U-undisclosed information. SES- socioeconomic status. Studies labelled with an asterisk signifies those included in the meta-analyses.

Within Group Effect Sizes

　　To account for the correlation between measures in a pre-post sample, a correlation coefficient was applied to all within-group ES estimates. These correlations were: Perfectionism, $r = 0.394$; ED, $r = 0.643$; Depression, $r = 0.513$; Anxiety, $r = 0.394$. As shown in **Table 2**, and **Figures 2 and 3**, perfectionism interventions were associated with large and significant effect size decreases in symptoms of perfectionism and disordered eating. Significant and moderate effect size decreases for symptoms of depression and anxiety were observed (**Figures 4 and 5**).

Table 2

Summary of effect sizes (and 95% confidence intervals) with Heterogeneity and Publication Bias (Egger's test)

Construct	Within-group (n=9)					Between-group (n=8)				
	Effect size		Heterogeneity		Egger's test	Effect size		Heterogeneity		Egger's Test
					Y intercept (p)					*Y intercept (p)*
	Hedge's *g*	95% CI	*I^2*	*Q (p)*		Hedge's *g*	95% CI	*I^2*	*Q (p)*	
Perfectionism		-1.673, -	86.246	58.164	-6.231		-1.967, -	91.975	87.23	-7.590
	-1.231	0.789		(0.00)	(0.005)	-1.278	0.589		(0.00)	(0.041)
Eating disorder		-1.319, -	92.833	111.63	-9.146		-1.267, -	91.011	77.875	-7.555
	-0.913	0.506		(0.00)	(0.003)	-0.64	0.013		(0.00)	(0.065)
Depression		-0.897, -	80.823	36.503	-5.907		-0.919,	78.52	23.277	-7.349
	-0.605	0.314		(0.00)	(0.024)	-0.447	0.025		(0.00)	(0.068)
Anxiety		-0.637 -	62.869	18.852	-4.673		-0.361,	8.848	5.485	-1.757
	-0.413	0.188		(0.01)	(0.029)	-0.140	0.081		(0.36)	(0.490)

Figure 2

Forest Plot for Pre-Post Perfectionism Intervention Effect on Perfectionism Symptoms

Pre-post trial comparison for Perfectionism: Perfectionism Intervention

Study name	Hedges's g	Standard error	Variance	Lower limit	Upper limit	Z-Value	p-Value	Hedges's g and 95% CI
Grieve et al (2020)	-0.733	0.172	0.029	-1.069	-0.397	-4.273	0.000	
Handley et al (2015)	-1.137	0.301	0.091	-1.728	-0.547	-3.776	0.000	
Johnson et al (2019)	-0.750	0.219	0.048	-1.180	-0.320	-3.418	0.001	
Kothari et al (2019)	-0.982	0.169	0.028	-1.313	-0.651	-5.818	0.000	
Shu et al (2019)	-1.056	0.226	0.051	-1.499	-0.614	-4.677	0.000	
Steele et al (2008)	-1.150	0.354	0.126	-1.845	-0.455	-3.244	0.001	
Valentine et al (2018)	-6.252	0.809	0.654	-7.837	-4.667	-7.731	0.000	
Wade et al (2019)	-1.459	0.295	0.087	-2.038	-0.881	-4.948	0.000	
Wilksch et al (2008)	-0.394	0.184	0.034	-0.756	-0.033	-2.141	0.032	
	-1.198	0.219	0.048	-1.628	-0.767	-5.457	0.000	

-2.00   -1.00   0.00   1.00   2.00

Decrease Symptoms   Increase Symptoms
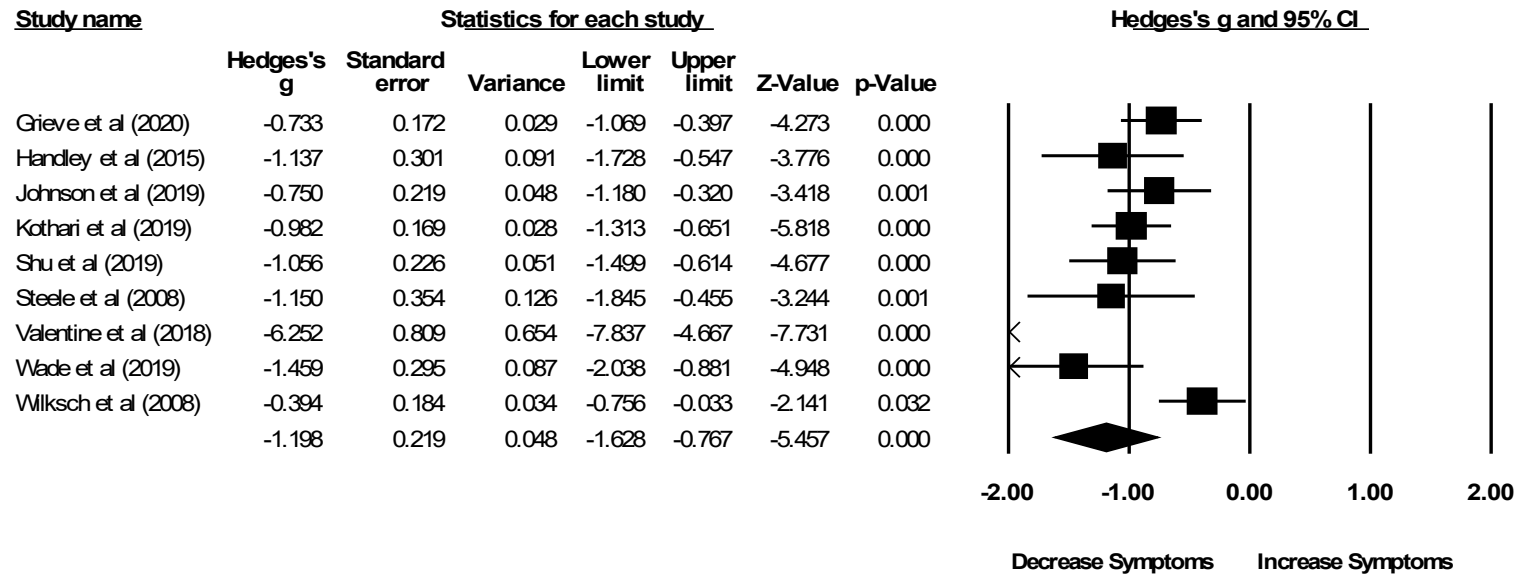
Meta Analysis: Random Effects Model

Figure 3

Forest Plot for Pre-Post Perfectionism Intervention Effect on Eating Disorder and Body Image Symptoms

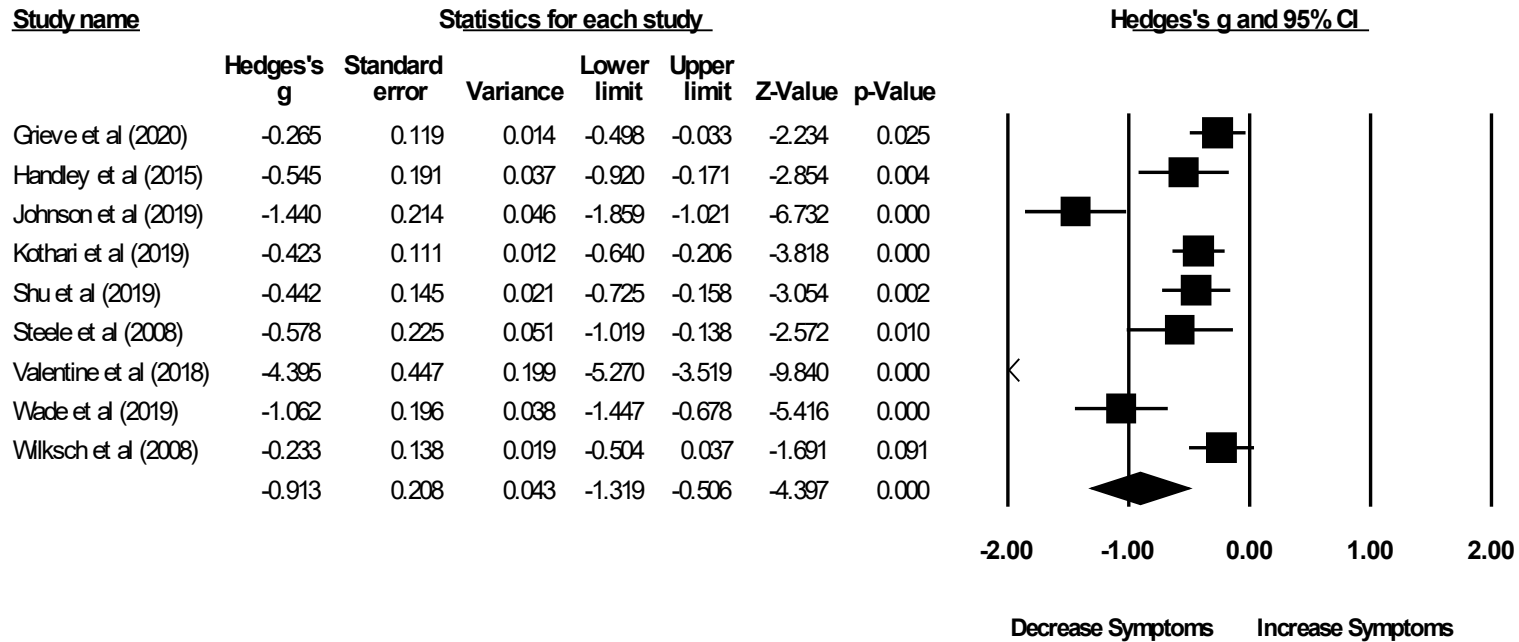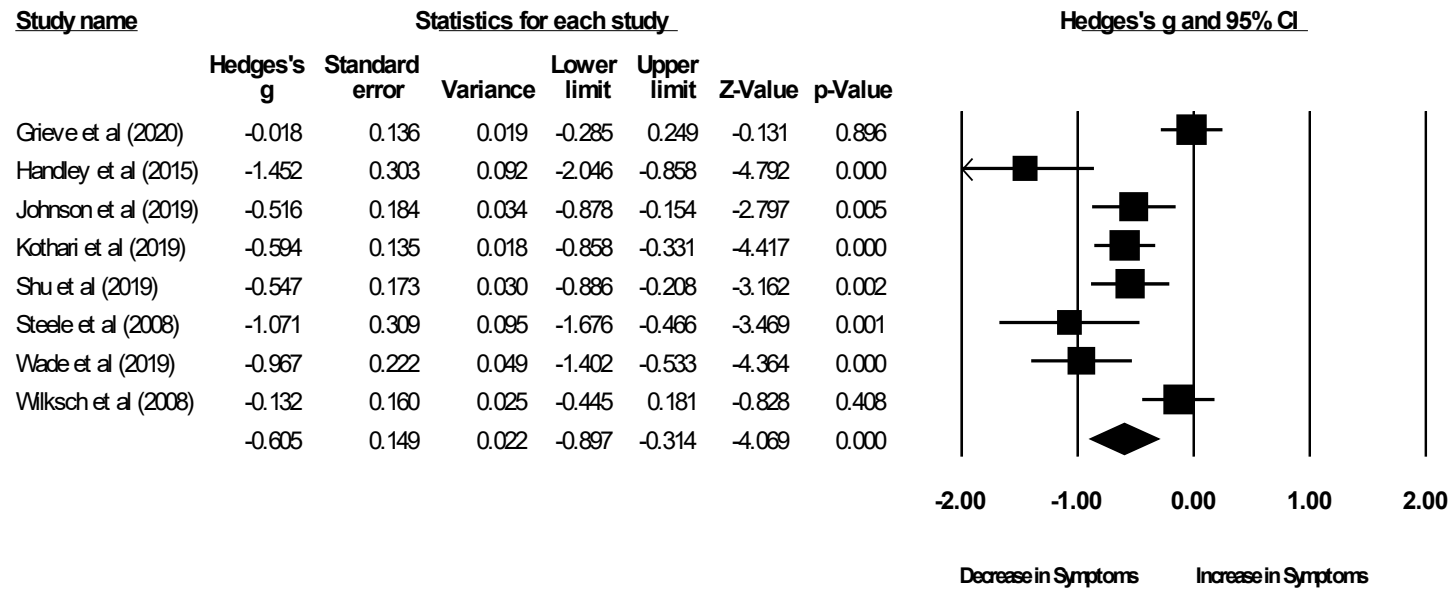## Pre-post trial comparison for Disordered Eating: Perfectionism Intervention

Study name	Hedges's g	Standard error	Variance	Lower limit	Upper limit	Z-Value	p-Value
Grieve et al (2020)	-0.265	0.119	0.014	-0.498	-0.033	-2.234	0.025
Handley et al (2015)	-0.545	0.191	0.037	-0.920	-0.171	-2.854	0.004
Johnson et al (2019)	-1.440	0.214	0.046	-1.859	-1.021	-6.732	0.000
Kothari et al (2019)	-0.423	0.111	0.012	-0.640	-0.206	-3.818	0.000
Shu et al (2019)	-0.442	0.145	0.021	-0.725	-0.158	-3.054	0.002
Steele et al (2008)	-0.578	0.225	0.051	-1.019	-0.138	-2.572	0.010
Valentine et al (2018)	-4.395	0.447	0.199	-5.270	-3.519	-9.840	0.000
Wade et al (2019)	-1.062	0.196	0.038	-1.447	-0.678	-5.416	0.000
Wilksch et al (2008)	-0.233	0.138	0.019	-0.504	0.037	-1.691	0.091
	-0.913	0.208	0.043	-1.319	-0.506	-4.397	0.000

Hedges's g and 95% CI

-2.00   -1.00   0.00   1.00   2.00

Decrease Symptoms   Increase Symptoms

Meta Analysis: Random Effects Model

Figure 4

Forest Plot for Perfectionism Intervention Within Group Effect on Depression Symptoms

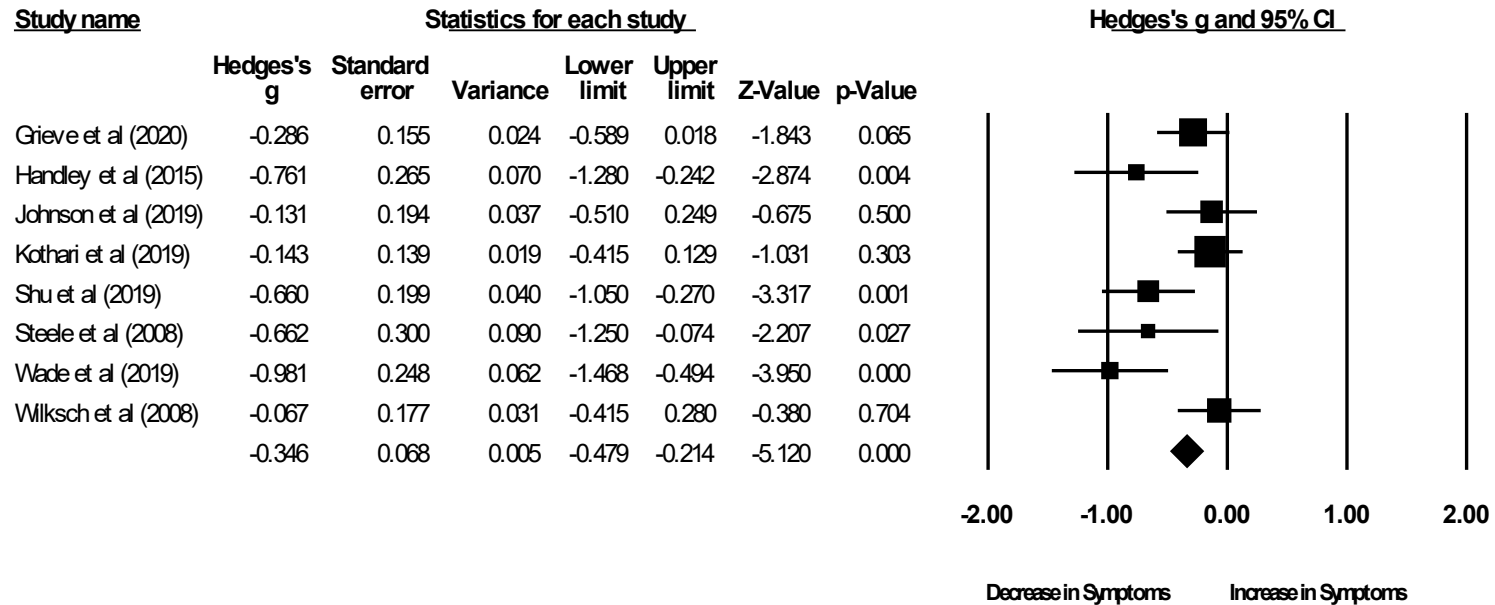## Pre-post trial comparison for Depression: Perfectionism Intervention

Study name	Hedges's g	Standard error	Variance	Lower limit	Upper limit	Z-Value	p-Value	Hedges's g and 95% CI
Grieve et al (2020)	-0.018	0.136	0.019	-0.285	0.249	-0.131	0.896	
Handley et al (2015)	-1.452	0.303	0.092	-2.046	-0.858	-4.792	0.000	
Johnson et al (2019)	-0.516	0.184	0.034	-0.878	-0.154	-2.797	0.005	
Kothari et al (2019)	-0.594	0.135	0.018	-0.858	-0.331	-4.417	0.000	
Shu et al (2019)	-0.547	0.173	0.030	-0.886	-0.208	-3.162	0.002	
Steele et al (2008)	-1.071	0.309	0.095	-1.676	-0.466	-3.469	0.001	
Wade et al (2019)	-0.967	0.222	0.049	-1.402	-0.533	-4.364	0.000	
Wilksch et al (2008)	-0.132	0.160	0.025	-0.445	0.181	-0.828	0.408	
	-0.605	0.149	0.022	-0.897	-0.314	-4.069	0.000	

-2.00   -1.00   0.00   1.00   2.00

Decrease in Symptoms   Increase in Symptoms

Meta Analysis: Random Effects Model

Figure 5

Forest Plot for Perfectionism Intervention Within Group Effect on Anxiety Symptoms

Pre-post trial comparison for Anxiety: Perfectionism Intervention

Study name	Hedges's g	Standard error	Variance	Lower limit	Upper limit	Z-Value	p-Value	Hedges's g and 95% CI
Grieve et al (2020)	-0.286	0.155	0.024	-0.589	0.018	-1.843	0.065	
Handley et al (2015)	-0.761	0.265	0.070	-1.280	-0.242	-2.874	0.004	
Johnson et al (2019)	-0.131	0.194	0.037	-0.510	0.249	-0.675	0.500	
Kothari et al (2019)	-0.143	0.139	0.019	-0.415	0.129	-1.031	0.303	
Shu et al (2019)	-0.660	0.199	0.040	-1.050	-0.270	-3.317	0.001	
Steele et al (2008)	-0.662	0.300	0.090	-1.250	-0.074	-2.207	0.027	
Wade et al (2019)	-0.981	0.248	0.062	-1.468	-0.494	-3.950	0.000	
Wilksch et al (2008)	-0.067	0.177	0.031	-0.415	0.280	-0.380	0.704	
	-0.346	0.068	0.005	-0.479	-0.214	-5.120	0.000	

-2.00   -1.00   0.00   1.00   2.00

Decrease in Symptoms   Increase in Symptoms

Meta Analysis: Random Effects Model

Between Group Effect Sizes

Displayed in **Table 2**, and **Figures 6** and **7**, perfectionism intervention cohorts experienced significantly greater reductions in perfectionism and disordered eating compared to comparison groups. There was no significant difference in symptoms of depression and anxiety when compared to control condition cohorts (see **Figures 8** and **9**). Between-group results for disordered eating and perfectionism were further investigated using post-hoc analyses. The between-group meta-analyses were split into several sub-groups to reduce heterogeneity, these groups were: RCTs studies only (n = 6), self-guided studies only (n = 5), online studies only (n = 5), and studies which used the EDE-Q (global) as a disordered eating measure (n = 6). No significant or clinically relevant alterations came from these attempts to subdivide the studies into more homogenous samples (**Table 3**).

Figure 6

Forest Plot for Perfectionism Intervention Between Group Effect on Perfectionism Symptoms

Post-trial comparison for Perfectionism: Perfectionism Intervention vs Control Condition

Study name	Hedges's g	Standard error	Variance	Lower limit	Upper limit	Z-Value	p-Value
Grieve et al (2020)	-0.419	0.210	0.044	-0.831	-0.007	-1.991	0.046
Handley et al (2015)	-1.195	0.330	0.109	-1.841	-0.549	-3.625	0.000
Kothari et al (2019)	-0.997	0.193	0.037	-1.374	-0.619	-5.175	0.000
Shu et al (2019)	-0.656	0.267	0.071	-1.179	-0.132	-2.456	0.014
Steele et al (2008)	-0.604	0.404	0.163	-1.396	0.187	-1.496	0.135
Valentine et al (2019)	-7.528	0.766	0.586	-9.029	-6.028	-9.833	0.000
Wade et al (2019)	-0.665	0.285	0.081	-1.224	-0.107	-2.337	0.019
Wilksch et al (2008)	-0.359	0.236	0.056	-0.822	0.103	-1.524	0.128
	-1.278	0.351	0.124	-1.967	-0.589	-3.637	0.000

Hedges's g and 95% CI

-2.00   -1.00   0.00   1.00   2.00

Favours Intervention   Favours Control

Meta Analysis: Random Effects Model

Figure 7

Forest Plot for Perfectionism Intervention Between Group Effect on Disordered Eating Symptoms

Post-trial comparison for Disordered Eating: Perfectionism Intervention vs Control Condition

Study name	Hedges's g	Standard error	Variance	Lower limit	Upper limit	Z-Value	p-Value	Hedges's g and 95% CI
Grieve et al (2020)	-0.130	0.208	0.043	-0.538	0.278	-0.626	0.532	
Handley et al (2015)	-1.021	0.323	0.104	-1.653	-0.388	-3.163	0.002	
Kothari et al (2019)	-0.180	0.182	0.033	-0.536	0.177	-0.987	0.323	
Shu et al (2019)	-0.145	0.260	0.068	-0.655	0.366	-0.555	0.579	
Steele et al (2008)	-0.188	0.396	0.157	-0.963	0.588	-0.474	0.635	
Valentine et al (2019)	-4.106	0.473	0.224	-5.034	-3.178	-8.673	0.000	
Wade et al (2019)	-0.171	0.278	0.077	-0.715	0.373	-0.617	0.537	
Wilksch et al (2008)	0.297	0.235	0.055	-0.164	0.758	1.264	0.206	
	-0.630	0.316	0.100	-1.249	-0.011	-1.995	0.046	

-2.00   -1.00   0.00   1.00   2.00

Favours Intervention   Favours Control

Meta Analysis: Random Effects Model

Figure 8

Forest Plot for Perfectionism Intervention Between Group Effect on Depression Symptoms

Post-trial comparison for depression: Perfectionism Intervention vs Control Condition

Study name	Hedges's g	Standard error	Variance	Lower limit	Upper limit	Z-Value	p-Value
Grieve	0.048	0.219	0.048	-0.381	0.477	0.218	0.828
Handley	-1.606	0.350	0.122	-2.292	-0.920	-4.590	0.000
Kothari	-0.545	0.241	0.058	-1.017	-0.073	-2.263	0.024
Shu	-0.014	0.260	0.068	-0.524	0.496	-0.054	0.957
Steele	-0.944	0.417	0.174	-1.761	-0.127	-2.265	0.024
Wilksch	0.047	0.234	0.055	-0.412	0.505	0.199	0.842
	-0.447	0.241	0.058	-0.919	0.025	-1.857	0.063

Hedges's g and 95% CI

-2.00   -1.00   0.00   1.00   2.00

Favours Perfectionism Intervention   Favours Control Condition

Meta Analysis: Random Effects Model

Figure 9

Forest Plot for Perfectionism Intervention Between Group Effect on Anxiety Symptoms

Post-trial comparison for anxiety: Perfectionism Intervention vs Control Condition

Study name	Statistics for each study							Std diff in means and 95% CI
	Std diff in means	Standard error	Variance	Lower limit	Upper limit	Z-Value	p-Value	
Grieve	0.207	0.213	0.045	-0.211	0.624	0.969	0.333	
Handley	-0.452	0.313	0.098	-1.064	0.161	-1.445	0.148	
Kothari	-0.352	0.241	0.058	-0.824	0.120	-1.460	0.144	
Shu	-0.368	0.266	0.071	-0.889	0.152	-1.386	0.166	
Steele	0.000	0.408	0.167	-0.800	0.800	0.000	1.000	
Wilksch	-0.028	0.237	0.056	-0.492	0.435	-0.120	0.904	
	-0.140	0.113	0.013	-0.361	0.081	-1.241	0.215	

-1.00 -0.50 0.00 0.50 1.00

Favours Perfectionism Intervention   Favours Control Condition

Meta Analysis: Random Effects Model

Table 3

Sub-divided Analyses of Between-group Effect Sizes (Random Effects Model)

Inclusion criteria (Construct)	ES (CI)	Number of studies included	Heterogeneity	
			Q value	*I^2*
RCTs (Perfectionism)	-1.633 (-2.584, -0.681)	6	82.261	93.948
RCTs (ED)	-0.891 (-1.709, -0.073)	6	69.142	92.769
Self-guided therapies (Perfectionism)	-1.741 (-2.998, -0.484)	5	81.202	95.074
Self-guided therapies (ED)	-0.890 (-1.941, 0.162)	5	64.800	93.827
Online studies (Perfectionism)	-1.740 (-2.813, -0.666)	5	81.825	95.112
Online studies (ED)	-0.854 (-1.755, 0.046)	5	65.950	93.935
EDE-Q measure used (Perfectionism)	0.498 (-2.611, -0.658)	6	82.600	93.947

EDE-Q measure used (ED)	-0.828 (-1.710, 0.055)	6	76.432	93.458

Heterogeneity

Significant heterogeneity was found across all analyses, ranging from 62-93%, except for between-group comparisons of anxiety. Q and I^2 values are reported in **Table 2**.

Publication Bias

Publication bias was present in all within-group analyses, as shown by Egger's test in **Table 2**. Publication bias was not apparent for between-group comparisons related to disordered eating, depression, and anxiety but was evident for perfectionism. Due to the presence of substantial heterogeneity, further analysis of publication bias (i.e. the *Trim and Fill* approach by Duval and Tweedie) could not be performed.

Quality Assessment

Study quality was rated across nine items selected from the full Consort 2010 checklist (see **Table 4**). The results of the first quality assessment, addressing all studies included in the meta-analysis, are summarised in **Figure 11**. The average number of items achieved ('Yes' responses) for each study was six (range two to eight), the average number of items not achieved ('No' responses) was two (range zero to five). The only item unmet by the majority (>50%) of studies was the inclusion of a baseline demographics table describing participants. Age and gender were the only demographic factors routinely reported.

The Cochrane Risk of Bias (II) tool was applied to six RCTs included in the meta-analysis. Of the six analysed, one study received an overall bias rating of 'Low' and the

remaining five were of 'Some' concern. The area of greatest concern, where risk of bias was rated as 'High' for two of the six RCTs, was the handling of missing outcome data (**Figure 12**).

Table 4

Quality Ratings for Studies Included in the Meta-Analysis

Study	Eligibility criteria for participants	Sufficient detail of the intervention for each group, to allow replication, including how and when they were administered	Rationale for numbers	For each group, the numbers of participants who were approached, assessed, randomly assigned, received intended treatment	For each group, losses and exclusions after randomisation, together with reasons	A table showing baseline demographic and clinical characteristics for each group	For each objective, number of participants (denominator) included in each analysis. If relevant, these numbers should be by randomised group	For each objective, results including expressions of uncertainty (such as 95% confidence interval) for any estimates.	Ethical approval or approval by research review committee, confirmed with reference number
Grieve et al, 2020	Y	P	Y	Y	N	N	P	Y	N
Handley et al., 2015	Y	N	Y	Y	Y	Y	P	P	P
Johnson et al., 2019	Y	Y	N	Y	Y	N	P	Y	Y
Kothari et al., 2019	Y	Y	Y	Y	P	P	Y	Y	Y
Shu et al., 2019	Y	P	Y	Y	Y	Y	N	Y	Y

Steele &Wade, 2008	Y	P	P	Y	Y	Y	Y	N	P
Valentine et al., 2018	Y	Y	Y	Y	Y	N	Y	Y	N
Wade et al., 2019	Y	Y	Y	Y	Y	N	Y	Y	Y
Wilksch et al., 2008	N	Y	N	N	N	N	Y	P	P

Note: Y=Yes; criteria fulfilled. N= No; criteria not fulfilled. P= Partial; criteria partially fulfilled.

Figure 11

Quality Assessment by Item Expressed as Percentages Across All Studies Included in the Meta-Analysis
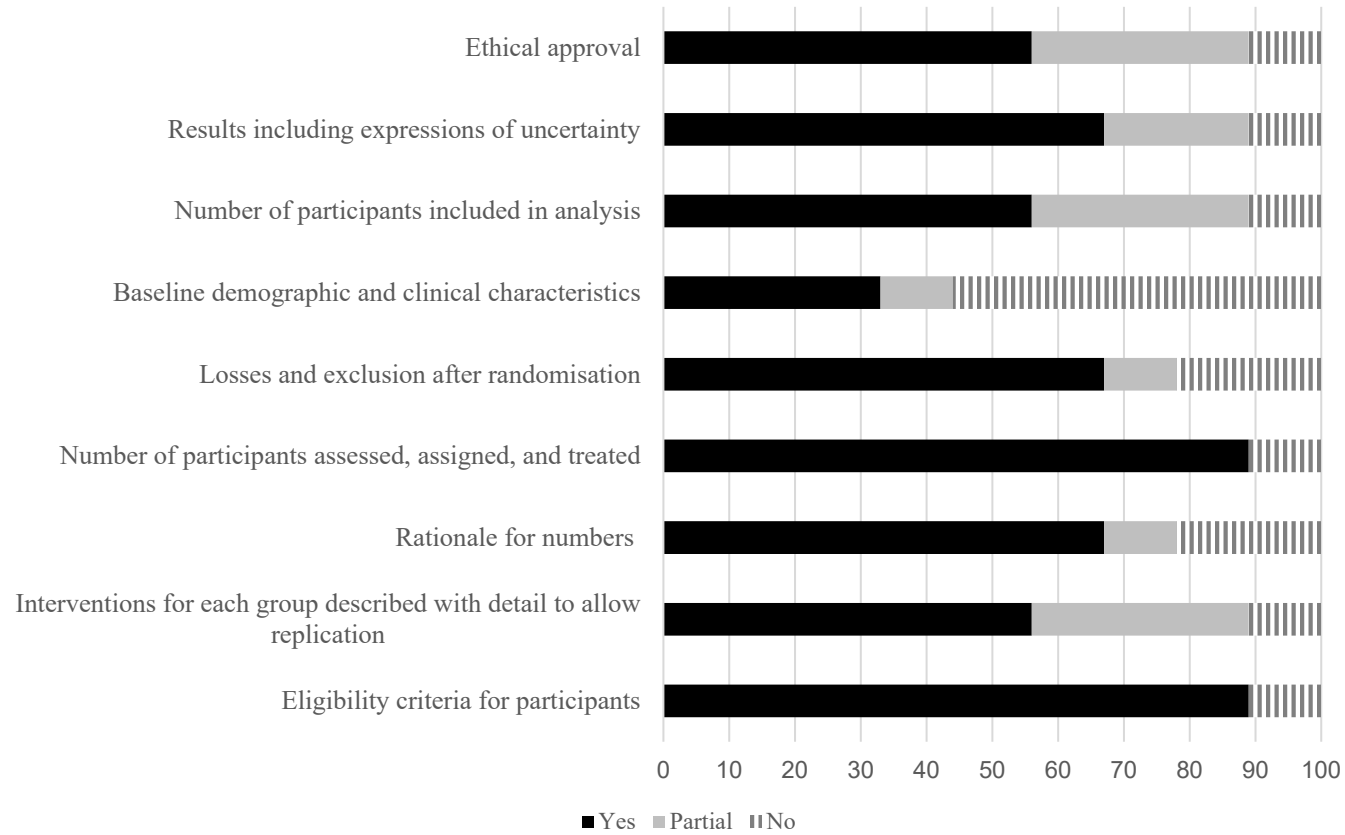
Figure 12

Cochrane Risk of Bias Quality Assessment Summary
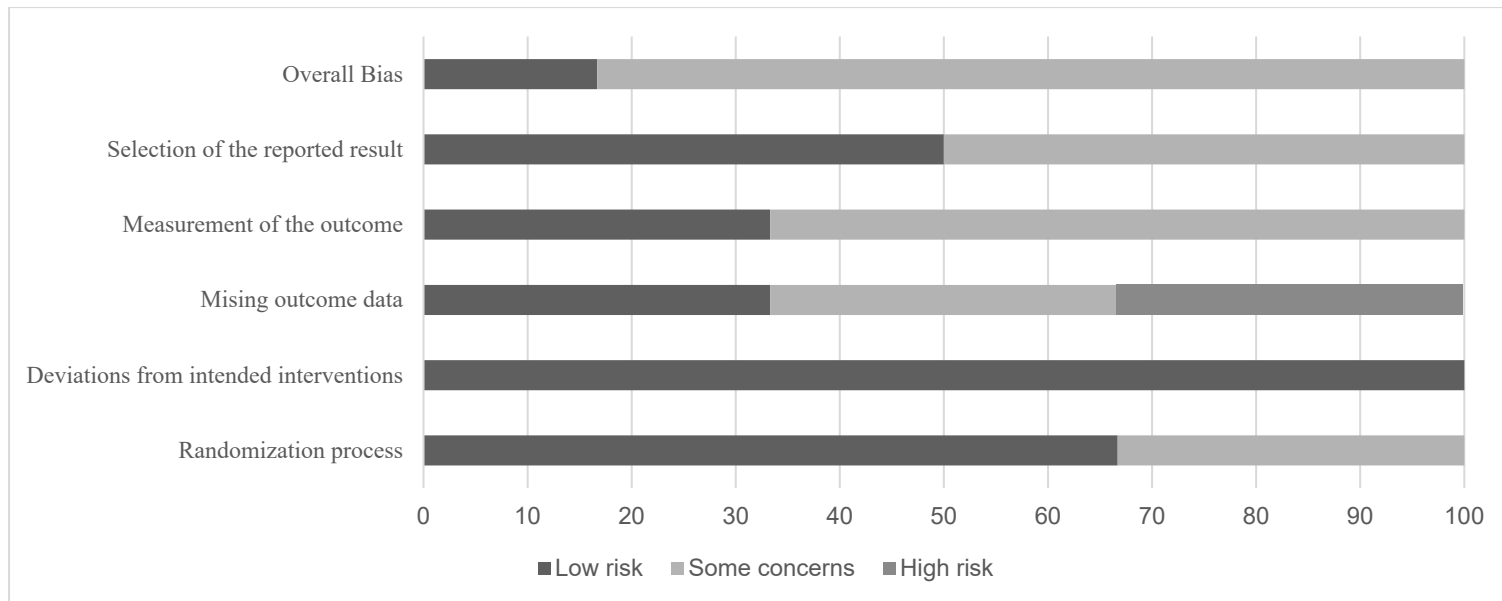
Note. Proportion of items in each risk category displayed as percentage (using intention to treat).

Discussion

The purpose of this review and meta-analysis was to investigate the use of perfectionism interventions which assessed symptoms of perfectionism and disordered eating. This review analysed both within-group and between-group effect estimates to determine the efficacy of perfectionism interventions for reducing perfectionism, disordered eating, depression, and anxiety. The results indicate perfectionism interventions were associated with a large effect for reducing perfectionism and disordered eating (between-group and within-group analyses), and a moderate effect for reducing depression and anxiety (within-group analyses only). These outcomes are consistent with the earlier findings by Lloyd et al. (2015) and Suh et al. (2019) who reported comparable ES estimates in their meta-analyses for depression, anxiety, and perfectionism. This updated analysis indicates disordered eating is responsive to perfectionism treatment in clinical and non-clinical populations. The findings from this meta-analysis indicate perfectionism interventions may effectively reduce disordered eating symptoms in populations who are not characterised by high levels of perfectionism. This conclusion, however, was based on divided evidence from three studies (Johnson et al., 2019; Steele & Wade, 2008; Wilksch, Durbridge, & Wade, 2008) and further investigation is needed with studies targeting populations with disordered eating, rather than elevated perfectionism, as their primary concern.

Heterogeneity

Results from this review should be interpreted with caution as high heterogeneity was found across all analyses but one. Reasons for heterogeneity were unable to be explored, through meta-regression, due to the small sample size and lack of potential moderators reported within the selected studies. Attempts were made to reduce heterogeneity by

subdividing the studies from the between-group meta-analyses into groups based on design, demographic, or outcome variables. Heterogeneity remained high across all subdivided analyses. Heterogeneity may result from statistical, clinical, or methodological factors, or the presence of publication bias (Fletcher, 2007). While Egger's test results indicate the presence of publication bias, these findings are inconclusive unless all other reasons for possible heterogeneity can be excluded. Due to the nature of this review, few studies were available for inclusion and variations existed in the studies' designs, interventions, outcome measures, and participant selection criteria. Target populations included a mix of elevated perfectionism, elevated disordered eating/body image concerns, non-clinical/self-identified perfectionists, and high school students with no clinically relevant traits. These variations suggest clinical heterogeneity may have been a contributing factor, however, a greater number of studies are needed to distinguish the cause or causes of heterogeneity and whether publication bias was genuinely present.

Further Limitations

The results of the meta-analysis should be interpreted in the context of three important limitations. First, perfectionism was investigated as a single outcome. Preference was given to analysing the FMPS-CM to allow for greater cross-study comparison, but in doing so it limited which aspects of perfectionism were explored and provided a unidimensional view of how perfectionism may respond to intervention. Future analyses may wish to take a more multidimensional approach when investigating perfectionism and to separately assess various components, particularly in instances where multiple perfectionism measures are provided. Including multiple measures will clarify which aspects of perfectionism are most responsive to treatment and help to identify which perfectionism measures correlate well with scores (and reductions) of disordered eating.

Second, the information presented in this meta-analysis regarding depression and anxiety was selected as a subsample from the total information available on this topic and should therefore be interpreted within this context. Only studies which assessed depression and anxiety along with a measure of disordered eating or body image concern were included in this review. A more accurate representation of the between-group ES estimates can be found in the analysis by Suh et al. (2019) who previously found a significant impact of perfectionism interventions on reducing depression and anxiety in randomised control trials. The between-group estimates for depression and anxiety in the current study were weaker in comparison to the Suh et al. (2019) study, potentially due to a lack of power. These estimates should be considered only as comparators for within this study, and not as absolute values which fully account for the effect of perfectionism interventions on symptoms of depression and anxiety.

Third, within-group ES estimates, while providing a useful comparison to previous meta-analyses (Lloyd et al., 2015), tend to be less reliable than between-group ES estimates. Within-group analyses are limited by the absence of a control group comparator and are affected by the association between pre- and post-trial data. To account for these limitations, both between-group and within-group ES estimates have been provided for this meta-analysis, and the relationship between pre-post data was accounted for using estimated correlation coefficients (r). Ideally, correlation coefficients should be calculated for each study to ensure accuracy of the ES estimates. Correlation coefficients, however, were not reported for most studies. Consequently, next best practice was employed (Cuijpers, Weitz, Cristea, & Twisk, 2017) which was to estimate the correlation coefficient for each construct using previous research by Shafran et al., 2017. Using an estimate from a single study introduces biases such that missing data in the Shafran et al. dataset likely impacted the

within-group ES estimates. Future studies should consider routinely reporting the correlation coefficient (r) to allow for accurate calculations of ES estimates in within-group analyses.

Despite these limitations, this meta-analysis provides important early evidence as to the potential efficacy of perfectionism interventions as a transdiagnostic treatment tool across a variety of participant demographics and study designs. Given the preliminary nature of these findings, understanding the impact of moderators would provide a valuable addition to this research. Moderators may account for unexplained variance (heterogeneity) and have clinical implications regarding to how to best implement perfectionism interventions to a targeted audience. Potential moderators for future investigation include: sex, age, duration of disordered eating behaviours, clinical versus non-clinical groups, dimensions of perfectionism experienced, study design, intervention modality, and study quality.

Conclusion

This meta-analysis of the impact of perfectionism interventions on disordered eating and body image concerns presents preliminary findings, given the small sample size and high heterogeneity, which invites further investigation and more informed analyses in the future. Nevertheless, these preliminary findings hold promise for the continued use of perfectionism interventions as a transdiagnostic treatment option for disordered eating and body image concerns. There are a great many specific factors to be investigated around how to best utilise this treatment option, who may benefit, and under what conditions.

CHAPTER FOUR:
MEASURES

The measures described in the following chapter provide a detailed summary of those used in **Chapters Five**, **Six**, and **Seven**. Subsequent chapters will, where relevant, provide study-specific details for the measures and their psychometric properties. The following measures were chosen due to their relevancy to the constructs discussed in the study chapters and their robust psychometric properties.

Weight Concerns Scale

Description and Factor Structure

The Weight Concerns Scale (WCS; Killen et al., 1994) is used to identify risk for the development of an eating disorder by assessing current weight and shape concerns, fear of gaining weight, and dieting history (Bauer et al., 2019; Killen et al., 1994; Taylor, 2017). Principal components analysis was used to select items for the WCS from a list of eating disorder attitudes and behaviours (Killen et al., 1993). Items relating to fear of weight gain, concerns regarding weight and body shape, diet history, and perceived fatness were highly correlated and combined into the one variable of weight concerns (Killen et al., 1994). Scores of ≥52 have been demonstrated to be indicative of the development of an eating disorder in adolescent females over a three-year period (Killen et al., 1994). Later, a Receiver Operating Characteristic (ROC) curve analysis was performed by Jacobi et al. (2004) to determine a cutoff score of ≥47 as having positive predictive value for the development of a partial or full syndrome eating disorder. The WCS consists of five items scored on a Likert scale using up to a 7-point continuum. The WCS consists of one item scored on a 4-point scale (i.e. *Compared to other things in your life, how important is your weight to you?*), three items scored on a 5-point scale (e.g. *Do you ever feel fat?*), and one item on a 7-point scale (i.e. *When was the last time you went on a diet?*). Item scores are converted to a 100-point scale and averaged to give a score range between 0 (no weight concern) and 100 (maximum weight concern; Killen et al., 1994).

Validity

The WCS shown to have an excellent ability to predict the onset of eating disorders in adolescent girls over a three-year (Killen et al., 1994) and four-year (Killen et al., 1996) period. Girls who scored in the top quartile of the WCS had a 10-12% incidence rate for developing an eating disorder, compared with girls who scored in the lowest quartile having a 0-2% incidence rate (Killen et al., 1996; Killen et al., 1994). Concurrent and divergent validity of the WCS has been tested in university students from Brazil, Portugal, and Mozambique (Dias et al., 2015; Silva et al., 2017). Correlational analysis indicated adequate concurrent validity with Body Shape Questionnaire ($r = 0.95$, $p < 0.001$; Silva et al., 2017), which is also a measure of body shape concern, and the Sick Control One Fat Food ($r = 0.56$-0.61, $p < .001$; Brasil et al., 2023), a measure of eating disorder symptomology. Good divergent validity has been demonstrated with the Perceived Health Competence Scale ($r = -0.26$, $p < 0.001$; Silva et al., 2017) and the Maslach Burnout Inventory for Students ($r = -.068$–$.143$, $p < .05$; Dias et al., 2015).

Invariance testing indicates differences exist in how body concerns are perceived in different populations. The absence of invariance has been demonstrated for different nationalities (Brazilian, Portuguese, and Mozambican; Silva et al., 2017) and different genders (Brasil et al., 2023). These findings indicate the differences exist in the evaluation of body weight concerns across cultures and genders, such that the use of the WCS may benefit from adaptation for use in non-White and non-female populations.

Reliability

High test-retest reliability was demonstrated over a seven-month period ($r = 0.71$; Killen et al., 1994) and a 12-month period ($r = 0.75$; Killen et al., 1996). Adequate internal consistency (Cronbach's $\alpha = .77$) has been demonstrated across Brazilian, Portuguese, and

Mozambican samples (Dias et al., 2015; Silva et al., 2017) as well as in male (Cronbach's α = .71) and female (Cronbach's α = 0.77) populations (Brasil et al., 2023).

Eating Disorder-15

Description and Factor Structure

The Eating Disorder-15 (ED-15) is a brief 15-item questionnaire assessing cognitions and behaviours relating to disordered eating in the past week. The questionnaire comprises of 10 items relating to ED attitudes and cognitions and an additional five items where individuals report their engagement with an ED behaviour. A two-factor structure was determined using principal components analysis for the 10 attitudinal items in the ED-15 (Tatham et al., 2015) which was confirmed in replication studies (Rodrigues et al., 2019; Compte et al., 2022; Yilmaz et al., 2023). Six items load onto one factor labelled 'weight and shape concerns' (e.g. *[I] felt distressed about my weight*) and four items load onto the second factor labelled 'eating concerns' (e.g. *[I] worried about losing control over my eating*). Respondents rate their disagreement-agreement with each statement from 0 (*Not at all*) to 6 (*All the time*) using a Likert scale for the 10 attitudinal items. Respondents provide a tally for the number of times they engaged with a disordered behaviour for five items. Disordered behaviours include binging, purging, laxative use, dietary restriction, and exercise (e.g. *over the past week, how many times have you exercised hard in order to control your weight*?). Factor and overall attitudinal scores are calculated by taking the mean of the items included in the (sub)scale with higher scores indicating greater ED pathology (Tatham et al., 2015).

Validity

The scale creators validated the ED-15 (English version) in three samples: a non-clinical male and female sample, a female sample with self-reported EDs, and a clinical sample receiving ED treatment (Tatham et al., 2015). Language adapted versions of the ED-

15 have been psychometrically tested for the Spanish, Portuguese, and Turkish versions of the scale in both clinical and non-clinical populations (Compte et al., 2023; Rodrigues et al., 2019; Yilmaz et al., 2023). Concurrent validity of the ED-15 was assessed by comparison with the Eating Disorder Examination Questionnaire (EDE-Q), which is a gold standard self-report measure assessing ED cognitions and behaviours over the past 28 days. Overall score and both dimensions of the ED have been found to be moderately to highly correlated with all four dimensions of the EDE-Q in the English (r_s = .55 - .89; Tatham et al., 2015), Portuguese (r_s = .57 - .85; Rodrigues et al., 2019), Turkish (r_s = .53 – .81; Yilmaz et al., 2023) and Spanish versions (r_s = .66 - .89; Compte et al., 2022). Relative to non-ED measures, convergent validity analysis of the ED-15 suggests a moderate association with anxiety (General Anxiety Disorder Questionnaire, r = .52), depression (Patient Health Questionnaire, r = .61; Tatham et al., 2015), and a high correlation with clinical impairment (Clinical Impairment Assessment, r = .85; Rodrigues et al., 2019). The ED-15 has good discriminant validity by showing a strong negative association with body appreciation (Body Appreciation Scale II, r = -.76; Compte et al., 2022). Receiver operating characteristic (ROC) analysis was used to test the sensitivity and specificity of the ED-15 for predicting case status. Good discriminant validity was found for correctly classifying participant caseness, with an 80% probability of correctly identifying the presence of an ED in based on higher overall scores (Rodrigues et al., 2019).

Reliability

The ED-15's test-retest reliability was assessed in a clinical population over an 18-day period and was high for overall score (r = .79), weight and shape concern (r= .79), and eating concerns (r= .81; Tatham et al., 2015). Adequate test-rest reliability has been replicated since its initial validation for the weight and shape concerns subscale (.84-.88), eating concerns

subscale (.80-.84), and overall score (.84-.89; Compte et al., 2022; Rodrigues et al., 2019).

Internal consistency of both subscales was high in the English-version of the ED-15 (weight

and shape concerns, Cronbach's α = .94; eating concerns, Cronbach's α =.80; Tatham et al.,

2015). These findings have been replicated in the Portuguese, Turkish, and Spanish versions

(overall score, Cronbach's α = .77-.93; weight and shape concerns, Cronbach's α = .81-.92;

and eating concerns, Cronbach's α = .76-.94), in both clinical and non-clinical samples

(Compte et al., 2023; Rodrigues et al., 2019; Yilmaz et al., 2023).

Frost Multidimensional Perfectionism Scale

Description and Factor Structure

The Frost Multidimensional Perfectionism Scale (FMPS; Frost et al., 1990) is a self-

report questionnaire designed to capture the multifaceted nature of perfectionism. The FMPS

was created and originally psychometrically tested using samples of undergraduate female

students from elite American colleges (Frost et al., 1990; Parker & Adkins, 1995). To create

the FMPS, a list of 67 items was originally compiled which included items from two pre-

existing measures of perfectionism, one pre-existing measure of obsessive-compulsive

behaviours, and new items which fit conceptually with the authors' pre-determined

dimensions of perfectionism. Two rounds of factor analyses were conducted using a principal

factor solution. The number of items was reduced to 47, with ten factors, after the initial

round. A final list of 35 items, with six factors, were chosen which accounted for 64.5% of

the variance. The final scale contained two items from the Burns Perfectionism Scale, four

items from the Eating Disorders Inventory- Perfectionism subscale (Garner et al., 1983), and

three items from the Maudsley Obsessive-Compulsive Inventory (Rachman & Hodgson,

1980). The six factors identified were personal standards, concern over mistakes, parental

expectations, doubt over actions, and organisation.

The FMPS has been subject to criticism for its unstable factor structure and significant cross-loading of items, both of which were reported as early as in the original factor analyses conducted for the scale's creation (Frost et al., 1990; Stallman & Hurst, 2011). Despite perfectionism being generally accepted as a multidimensional construct, considerable debate remains as to the number of core components. Multiple factor analytic studies have been conducted which reduce the number of factors in the FMPS to two (Bieling et al., 2004), three (Purdon et al., 1999), four (Hawkins et al., 2006; Khawaja & Armstrong, 2005; Stöber, 1998), and five factors (Cox et al., 2002) and also suggested redundancy in the number of items in the total scale. Shortened versions have been proposed using 33 items (Hawkins et al., 2006), 29 items (Stallman & Hurst, 2011), 24 items (Khawaja & Armstrong, 2005), and 22 items (Cox et al., 2002). Due to this ongoing lack of clarity regarding the optimal factor structure and number of items, two of the FMPS subscales were chosen to represent the two most core components of perfectionism. Concern over mistakes has been proposed by Frost et al. (1990) to be "the most central component of perfectionism" (p. 454) and accounts for the most variance (25%) of any subscale. Excessively high personal standards have also been conceptualised as one of the most prominent features of perfectionism (Frost et al., 1993; Hamachek, 1978; Pacht, 1984; Stöber, 1998). Additionally, these two items are reliably found to load separately onto the two core dimensions of perfectionism: evaluative concerns and perfectionistic strivings (Bieling et al., 2004; Dunkley et al., 2006; Frost et al., 1993; Stoeber & Otto, 2006).

Of the original 35 items, the Concern over Mistakes (CM) subscale consists of nine items (e.g. *I should be upset if I make a mistake*) measuring the respondent's negative reactions to making mistakes and tendency to interpret mistakes as failures. The Personal Standards (PS) subscale consists of seven items (e.g. *I set higher goals than most people*) measuring the respondent's tendency to set very high standards and the importance placed on

meeting these standards for self-evaluation (Frost et al., 1990; Frost et al., 1993). Each subscale uses a 5-point scale ranging from 1 (*Strongly disagree*) to 5 (*Strongly agree*). Items are scored by tallying, with higher scores indicating higher endorsement of perfectionism.

Validity

Concurrent validity of the FMPS has been assessed against Hewitt and Flett's (1991) Multidimensional Perfectionism Scale (MPS-H). This 45-item self-report measure with the same namesake captures three dimensions of perfectionism: self-oriented perfectionism (self-imposed high standards), other-oriented perfectionism (high standards imposed on others), and socially prescribed perfectionism (concern over meeting the standards of others).

The PS subscale of the FMPS has been reported to correlate significantly with self-oriented perfectionism (r_s = .62-.70), socially prescribed perfectionism (r_s = .16-.37), and other-orientated (r_s = .33-.43; Frost et al., 1993; Purdon et al., 1998). The CM subscale correlated significantly with self-oriented perfectionism (r_s = .38-.60), socially prescribed perfectionism (**r_s** = .49-.70., and to a lesser extent with other-orientated (r_s = .22-.40; Frost et al., 1993; Purdon et al., 1998). Convergent validity has also been established with the measures of depression (Beck Depression Inventory; Beck et al., 1961), positive and negative affect (Positive and Negative Affect Schedule; Watson et al., 1998), neuroticism and conscientiousness (The Big Five; Costa & McCrae, 1992).

CM has been found to have a small to moderate positive correlation with depression (r_s =.28-.52; Cox et al., 2002; Frost et al., 1993; Minarik & Ahrens, 1996), a small correlation with negative affect (r = .26; Frost et al., 1993), and a moderate correlation with neuroticism (r_s =.52-.54, $p<.01$; Cox et al., 2002). PS, however, been demonstrated to both positively (r_s = .13, $p <.01$; Cox et al., 2002) and negatively (r =-.30, $p <.01$; Minarik & Ahrens, 1996) correlate with depression as well as have no significant correlation (Frost et al., 1993). PS has

also been indicated to correlate positively with both conscientiousness (r_s = .31-.39, p <.01) and neuroticism (r =.15, p <.01), and with positive affect (r = .25; Frost et al., 1993). Lastly, the FMPS has been indicated to have some predictive validity for differentiating between samples with or without ED symptomology. Franco et al. (2014) found significantly higher scores on the FMPS total score and CM subscale in Hispanic women with ED symptoms than in a healthy control group (t= 3.14, p<.001). Similarly, moderate correlations have been found between the CM subscale and The Eating Attitudes Test--26 (r = .43, p <.01; Garner et al., 1982,) and the Eating Disorders Inventory (r_s =.46-.59, p<.01; Frost et al., 1990; Garner et al., 1983; Minarik & Ahrens, 1996).

Reliability

High internal consistency has been reported for the total scale (Cronbach's α = .87-.90), the CM subscale (Cronbach's α = .87-.91), and the PS subscale (Cronbach's α = .78-.87; Franco et al., 2014; Frost et al., 1990) with no reported differences in gender (Parker & Adkins, 1995; Stöber, 1998). Test-retest reliability has been assessed for the total FMPS in a sample of Mexican female university students. The test-retest reliability was at adequate after one month (r =.80, p < .001) but showed decreased stability after two months (r =.67, p < .001; Franco et al., 2014).

The Forms of Self-Criticising/Attacking and Self-Reassuring Scale

Description and Factor Structure

The Forms of Self-criticism/Self-reassurance scale (FSCRS; Gilbert et al., 2004) is a 22-item questionnaire that measures the respondent's levels of self-criticism and self-reassurance when faced with adversity. The scale was derived from the clinical observations and notes of the first author which reflect typical self-critical and attacking thoughts, and abilities to self-reassure, experienced by depressed patients (Gilbert et al., 2004). The FSCRS

has undergone extensive psychometric testing across clinical and non-clinical samples in at least 13 different populations and across eight different language versions (Baião et al., 2015; Halamová et al., 2018; Kupeli et al., 2013). The factor structure of the FSCRS has been explored using exploratory factor analysis (EFA), confirmatory factor analysis (CFA), and item-response theory (Mokken) scale analysis (Castilho et al., 2015; Halamová et al., 2018; Kupeli et al., 2013). Principal components analysis was originally performed by the scale's creators to determine a three-factor model (Gilbert et al., 2004), which has been replicated in several further studies (Baião et al., 2015; Castilho et al., 2015; Halamová et al., 2018; Kupeli et al., 2013). Factor analysis indicates the presence of two forms of self-criticism and one form of self-reassurance. The two self-criticism components were self-hatred (five items) which captures self-dislike, self-persecution, or the desire to hurt the self (e.g. I have a sense of disgust with myself), and self-inadequacy (nine items) which captures a sense of personal inadequacy and internalised dejection in response to setbacks (e.g. I am easily disappointed with myself). The one component of self-reassurance (eight items) captures the ability to reassure the self and have a positive disposition towards the self (e.g. I encourage myself for the future; Gilbert et al., 2004). Respondents use a five-point Likert scale ranging from 0 (*Not at all like me*) to 4 (*Extremely like me*) to indicate the applicability of statements to themselves (e.g. *I do not like being me*). Whilst scoring instructions were not provided in the original article, summing of the subscales has been adopted as the main scoring technique (Baião et al., 2015).

Validity

The initial Gilbert et al. (2004) study compared the FSCRS against the Levels of Self-Criticism scale (LOSC; Thompson & Zuroff, 2000), which measures the two factors of comparative self-criticism and internalised self-criticism. Convergent validity of the FSCRS

was adequate when compared against the LOSC for self-inadequacy (r_s = .63-.77), self-hatred (r_s = .45-.55) and self-reassurance (r_s = -.63- -.45). Further studies have indicated the FSCRS to have acceptable convergent validity through moderate to high correlations with measures of self-compassion (self-inadequacy =-.70- -.63, self-hatred = -.68- -.53, self-reassurance = .56- .82), depression (self-inadequacy = .55-.64, self-hatred = .49-.66, self-reassurance = -.66- -.40), and life satisfaction (self-inadequacy = -.57, self-hatred = -.54, self-reassurance =.62; (Biermann et al., 2021; Castilho et al., 2015; Kupeli et al., 2013). Good discriminant validity has been demonstrated based on square correlations between self-inadequacy and self-reassurance (r^2 = .27- .42), between self-reassurance and self-hatred (r^2 =0.40-.42), and to a lesser extent between self-inadequacy and self-hatred (r^2 = .71-.79; Baião et al., 2015; Castilho et al., 2015).

Reliability

Internal consistency has been reported to be high in both clinical and non-clinical samples, including in the original Gilbert et al. (2004) study (self-inadequacy, Cronbach's α = .90; self-hatred, Cronbach's α = .86; self-reassurance, Cronbach's α = .86) and across multiple subsequent studies (self-inadequacy, Cronbach's α = .90-.91; self-hatred, Cronbach's α = .85-.87; self-reassurance, Cronbach's α = .85-.91; Baião et al., 2015; Biermann et al., 2021; Kupeli et al., 2013). Adequate test-retest reliability over a four-week interval has been reported using a Portuguese sample (self-inadequacy, r= 0.72, self-hatred, r= 0.78, self-reassurance, r= 0.65; Castilho et al., 2015).

The Depression, Anxiety, and Stress Scale- Short Form

Description and Factor Structure

The Depression, Anxiety, and Stress Scale- Short Form (DASS-21; Lovibond & Lovibond, 1995a) is a widely used self-report measure. Currently available in more than 40

languages (Bibi et al., 2020), the DASS-21 has been extensively psychometrically tested in clinical and non-clinical samples and across multiple language versions (Bibi et al., 2020; Chen et al., 2023; Coker et al., 2018; Kakemam et al., 2022; Laranjeira et al., 2023; Pezirkianidis et al., 2018). Only psychometric properties of the English-version of the DASS-21 are included to limit the overlap in psychometric data reported.

The scale consists of 21 items divided equally between three scales measuring the constructs of depression, anxiety, and stress. The depression scale (e.g., *I felt downhearted and blue*) measures feelings of low self-esteem, low positive affect, and hopelessness. The anxiety scale (e.g., *I felt I was close to panic*) measure feelings of fear and physiological hyperarousal. The stress scale (e.g., *I found it hard to wind down*) measures feelings of agitation, tension, and negative affect (Gloster et al., 2008). The self-reported items use a 4-point scale from 0 (*Did not apply to me at all*) to 3 (*Applied to me very much, or most of the time*) in terms of how much each statement applied over the past week. Higher scores on each of the subscales indicate greater levels of depression, anxiety, and stress, respectively. Items for the DASS-21 are taken from the full version of the DASS consisting of 42 items. The DASS-21 was chosen over the full version due to its comparable ability to measure and distinguish between the latent constructs, its lower intercorrelations between factors, greater item loadings onto single factors, and brevity (Antony et al., 1998).

Competing models for the factor structure of the DASS-21 have been proposed, including a one-factor, three-factor, and bifactor solution (Antony et al., 1998; Clara et al., 2001; Lovibond & Lovibond, 1995a Gomez et al., 2014; Henry & Crawford, 2005; Le et al., 2017; Osman et al., 2012). Mixed evidence has supported the original three-factor solution proposed by the scale's creators (Lovibond & Lovibond, 1995a) in both clinical and non-clinical samples (Antony et al., 1998; Gloster et al., 2008; Gomez et al., 2014). Exploratory

factor analysis (EFA) and confirmatory factor analysis (CFA) has been used to compare various models with three or four-factor structures. Henry and Crawford's (2005) analysis indicated the DASS-21 was optimally explained by a bifactor solution which proposes a general factor termed 'psychological distress' with three orthogonal factors being depression, stress, and anxiety. This suggested structure implies the DASS-21 can be employed as a measure for depression, anxiety, and stress, but that it also captures a fourth factor of generalised psychological distress from the composite scale.

Subsequent analysis by Osman et al. (2012) using CFA confirmed the optimal fit of the bifactor solution against alternative models. Osman et al. (2012) also conducted an exploratory item bifactor analysis. By allowing items to load onto more than one factor, the authors determined that 20 of the 21 items loaded more substantially onto the general distress factor than onto a specific subscale. Their analysis indicated 87% of the composite variance was accounted for by the general distress factor. So far, the bifactor solution is the most psychometrically robust model, with best model fit and accounting for the largest percentage of variance (87% for the bifactor structure versus 60% of the three-factor structure; Antony et al., 1998; Henry & Crawford, 2005).

Validity

Convergent validity for the DASS-21 has been assessed on multiple occasions against the Positive and Negative Affect Schedule (PANAS; Watson et al., 1998), Beck Depression Inventory II (BDI-II; Beck et al., 1996), and the Beck Anxiety Inventory (BAI; Beck et al., 1998). Composite scores on the DASS-21 were compared against the PANAS, a 20-item self-report measure of positive and negative affect (Watson et al., 1988). Findings indicate the DASS-21 to be strongly correlated with negative affect ($r = 0.69$- .77, $p < .01$), and negatively correlated with positive affect ($r = -.37 - -.24$, $p < .01$; Henry & Crawford, 2005; Gloster et

al., 2008). The composite DASS-21 scale was strongly associated with depressive symptoms (BDI-II; $r = .75-.80$, $p < .001$) and anxiety symptoms (BAI; $r = .69-.71$, $p < .001$; Osman et al., 2012; Gloster et al., 2008). Similar correlations were found between the Mixed Depression-Anxiety scale of the Mood and Anxiety Symptom Questionnaire (Watson & Clark, 1991) and the DASS-21 ($r = .73$, $p < .001$; Osman et al., 2012). The DASS-21 has been demonstrated to have good discriminant validity when assessed in a population of older adults (>60 years old). Participants diagnosed with an anxiety or mood disorder scored significantly higher on corresponding DASS-21 subscales than participants without a diagnosis (Gloster et al., 2008).

Reliability

Internal consistency has been demonstrated to be excellent for each of the DASS-21 subscales, using both clinical and non-clinical samples. Cronbach's α has been reported as.85-.94 for depression, .81-.87 for anxiety, and for .88-.91 stress, and .93 for the composite scale (Antony et al., 1998; Henry & Crawford 2005; Osman et al., 2012). McDonald's ω has been reported as .86-.88 for depression, .73-.83 for anxiety, and .85-.88 for stress (Gomez et al., 2014; Osman et al., 2012). Structural invariance was assessed over a three-month interval in a non-clinical sample of Australian older adults. Results showed invariance for the factor structure, factor loadings, and covariance between latent factors over a three-month period, indicating these psychometric characteristics were stable over time. Strong correlations across time were found between the same latent factors, indicating good temporal stability for depression, anxiety, and stress (Gomez et al., 2014).

The Warwick-Edinburgh Mental Well-Being Scale
Description and Factor Structure

The Warwick-Edinburgh Mental Well-Being Scale (WEMWBS; Tennant et al., 2007) assesses positive aspects of mental health using positively worded items. The WEMWBS was developed as a substantially revised version of an early well-being scale, the Affectometer 2 (Kammann & Flett, 1983). The original measure, developed in the 1980s, was reviewed via focus groups comprised of community samples and expert stakeholders. The WEMWBS scale was created using retained and reworded items from the Affectometer 2. The new scale is comprised of 14 items relating to hedonic and eudemonic aspects of mental health and psychological functioning including autonomy, competence, self-acceptance, and personal growth (Tennant et al., 2007). Items (e.g. *I've been feeling relaxed*) relate to the rater's experiences in the past 2 weeks and are scored on a 5-point Likert scale from 1 (*None of the time*) to 5 (*All of the time*). Overall scoring can range from a minimum of 14 to a maximum of 70, with higher scores indicating greater mental well-being. Confirmatory factor analysis using weighted least squares estimation indicates the WEMWBS measures a single construct of mental wellbeing (Tennant et al., 2007). Two- and three-factor models have also been assessed by Sarasjärvi et al. (2023) but showed no improved fit over the one factor model (Root Mean Square Error of Approximation < 0.06).

Validity

The WEMWBS has been validated using a student and population sample from the UK and a large nationally representative sample from Finland (Sarasjärvi et al., 2023; Tennant et al., 2007). Criterion validity was assessed using correlations between the WEMWBS and other well-being scales. The WEMWBS showed a moderate ($r = 0.43$, $p <.01$; Tennant et al., 2007) to high ($r = 0.72$, $p < .001$; Sarasjärvi et al., 2023) association with the overall health (EuroQol Health Status Visual Analogue Scale), a high correlation ($r = 0.73$, $p <.01$; Tennant et al., 2007) with life satisfaction (Satisfaction with Life Scale), and a

moderate ($r = -0.53$, $p <.01$; Tennant et al., 2007) to high ($r = -0.76$, $p <.001$; Sarasjärvi et al., 2023) negative association with mental illness (General Health Questionnaire). Neither floor nor ceiling effects were demonstrated in the WEMWBS for the UK sample. Missing item responses were considered for content validity which showed little evidence of skewness for all item responses (Tennant et al., 2007).

Reliability

Test-retest reliability was assessed at a one-week interval in the student population and indicated high reliability (0.83, $p < .01$; Tennant et al., 2007). High internal consistency was demonstrated in the Finnish sample (McDonald's Ω =0.98; Sarasjärvi et al., 2023) and in the UK student (Cronbach's α = 0.89) and population sample (Cronbach's α = 0.91; Tennant et al., 2007).

Credibility-Expectancy Questionnaire

Description and Factor Structure

The Credibility-Expectancy Questionnaire (CEQ; Devilly & Borkovec, 2000) measures treatment expectancy and rationale credibility for therapeutic interventions in clinical outcome studies. The CEQ is adapted from an original scale by Borkovec and Nau (1972) to address the logicalness, perceived efficacy, and feelings of confidence in a prescribed therapy. Both principal components analysis and confirmatory factor analysis have indicated the first three items load onto one factor (credibility) and the final three items load onto a second factor (expectancy; Coste et al., 2020; Devilly & Borkovec, 2000b; Silva et al., 2021). The CEQ uses two rating scales; four items (e.g. *At this point, how logical does the course offered to you seem?*) are rated from 1 (*Not at all*) to 9 (*Very*) and two items (e.g. *By the end of the course, how much improvement in your functioning do you think will occur?*) are scored from 0 to 100%. Item scores require standardising to calculate each factor. To

score credibility, the mean of the first three items is calculated. To score expectancy, items which use a 0-100% scale were converted to increments between 0 to 10 then used to calculate the mean of the final three items (Thompson-Hollands et al., 2014). The results of three studies which psychometrically assessed the CEQ are summarised by Devilly and Borkovec, 2000.

Validity

Expectancy scores have been demonstrated to have some ability to predict treatment outcome for depression ($r = -0.50$, $p < .05$), changes in subjective distress after a traumatic event ($r = 0.65$), and changes in general distress ($r = 0.74$; Devilly & Borkovec, 2000). Convergent validity analysis in the Portuguese version of the CEQ indicates no statistically significant association between credibility or expectancy and therapeutic alliance (Working Alliance Inventory; Falkenström et al., 2015) or depression (Beck Depression Inventory; Beck et al., 1996; Silva et al., 2021).

Reliability

Test-rest reliability was calculated over a one-week intervening period for 67 clients with general anxiety disorder (Devilly & Borkovec, 2000). High test-retest reliability was produced for both expectancy ($r = 0.82$, $p < .001$), and credibility ($r = 0.75$, $p < .001$) as well as for the combined scale rating ($r = 0.75$, $p < .001$). High internal consistency has been demonstrated for credibility (Cronbach's α =0.75-0.97) and expectancy (Cronbach's α =0.90-0.95) in the Portuguese, French, and English version of the CEQ (Coste et al., 2020; Devilly & Borkovec, 2000a; Silva et al., 2021).

CHAPTER FIVE:
FEASIBILITY TRIAL OF AN ONLINE PERFECTIONISM INTERVENTION FOR DISORDERED EATING USING TWO DIFFERENT RECRUITMENT METHODS

Abstract

The purpose of this uncontrolled trial was to assess the feasibility (rates of recruitment, retention, adherence, and indicative effect sizes) of a self-guided online perfectionism intervention. Two cohorts ($N = 31$), recruited online or through an undergraduate university course, were provided access to eight modules of an online perfectionism intervention. Website metrics were used to track program usage. Qualitative feedback was collected to identify barriers to accessing the intervention and suggested alterations prior to conducting a larger scale study (trial registration number ACTRN12621001448831p). None of the first cohort completed the online intervention, however, participants in the second cohort completed an average of 3 online modules per week with a participant retention rate of 97%. Qualitative feedback suggested program content should be shorter, more opportunities should be provided for self-reflection, and more interactive media should be included. These findings highlight the difficulties of successfully recruiting and engaging participants in self-guided online interventions. The use of incentivisation needs further consideration to ensure the success of future efficacy trials and real-world applications.

Maintaining participant engagement is a well-recognised difficulty for delivering multisession online mental health interventions, with open trials associated with poor uptake and adherence, and controlled trials achieving between 50% and 90% completion rates (Musiat et al., 2021). The barriers to treatment participation are particularly salient in eating disorders due to perceived stigmatisation and denial (Ali et al., 2017; Radunz et al., 2023). Therefore, it is imperative to look for ways to improve and optimise participant engagement within this population. Pilot trials are necessary to identify possible factors which influence uptake and adherence to an online program and seeking feedback from end-users may increase engagement (Linardon et al., 2021). Results can then be used to inform development of randomised controlled trials, and we can thus more responsibly utilise the considerable resources required to conduct such trials.

Building on the promising findings of the meta-analysis reported in **Chapter Three**, this research assesses the feasibility of an established internet perfectionism intervention specifically targeting a disordered eating population, by examining rates of recruitment, retention, adherence, and indicative effect sizes. Feasibility studies inform the development of interventions by examining their acceptability, appropriateness, and relevance for intended users. By conducting the trial on a smaller scale, feasibility studies can partially or fully assess the design features proposed for a main trial. This study aims to develop and refine the intervention and outcome measures, rather than test the implementation process or potential intervention effects which may be better addressed via an implementation or efficacy trial (Pearson et al., 2020).

The content for the perfectionism intervention evaluated in this chapter was adapted from the self-help book *Overcoming Perfectionism: A Self-Help Guide Using Cognitive Behavioural Techniques* (Shafran, Egan, & Wade, 2018). To date, use of the intervention has

not been trialled solely with people with disordered eating, and so the feasibility, acceptability, and quality of data collection procedures are unknown. The outcomes of this current study will allow for modifications to be made to the recruitment, design, intervention, and analysis prior to beginning a full-scale efficacy trial and to minimise the chance of foreseeable errors occurring (Leon et al., 2011).

Methods

Participants

Participants were eligible if they were aged 17-25 years old, experienced significant difficulties with body image and eating, defined as a score greater than 47 on the Weight Concern Scale (5 items, $\alpha = 0.74$; Killen et al, 1994), fluent in English, and had reliable internet access. A minimum age of 17 years was required for participation for two reasons. First, the intervention program was designed for young adults aged 17-25 years old. Second, the Flinders University Psychology Research Participation System has a minimum age requirement of 17 years old to participate in research. A weight concern cut-off of 47 was chosen based on prior studies suggesting this score is indicative of sub-clinical disordered eating and subsequent ED development in young female populations (Jacobi et al., 2011; Killen et al., 1996),

Participants were recruited in two cohorts. In the first cohort ($N = 10$), Cohort 1, recruitment occurred through social media (Facebook) posts, the National Eating Disorders Collaboration recruitment site, the Flinders University student wellbeing blog, and a local private psychology clinic specialising in eating disorder treatment. Participants were not provided with compensation for partaking in the program.

The second cohort, Cohort 2, was recruited through the Flinders University student research participation system ($N = 21$) and were incentivised with course credit in return for

completing all modules and surveys. This second method of recruitment was employed as a direct result of the underwhelming response to recruitment seen in the first cohort. Participants were provided with the opportunity to complete alternative studies or psychoeducational worksheets in return for course credit if they did not wish to participate in this trial. Across both cohorts 42 participants were screened and 31 were eligible for inclusion in the analysis. All participants who were deemed ineligible failed to meet the minimum cut-off score for weight and shape concerns.

Ethics and Trial Registration

Ethics approval for this study was received from the Flinders University Humans Research Ethics Committee (project number 2475). This trial was conducted as a prelude to a larger trial registered with ANZCTR (trial registration number ACTRN12621001448831p).

Intervention

Participants provided online informed consent then completed a questionnaire assessing eligibility, demographic information, perfectionism, and disordered eating. A summary of the online intervention, titled 'Focused Minds Program', can be found in **Table 1**. After each module participants were prompted to complete a survey to provide qualitative feedback about their experience. At end of treatment perfectionism and disordered eating were re-assessed. Surveys were administered via Qualtrics, and the intervention was hosted via the platform Wix. Modules were entirely self-guided; however, participants could request technical support by contacting the lead investigator. Participants were sent two automated check-in emails to encourage program usage.

Outcomes

Recruitment Rate

Recruitment rate is defined as the number of participants who enrolled for the study during the recruitment period (i.e., from the first date participants were able to enrol until the last).

Retention

Retention of study participants relates to the number of participants initially enrolled in the study compared to the number who completed all 8 module surveys. Attrition was calculated by comparing the number of responses recorded for each survey. Adherence is defined as compliance with the recommended and intended use of a program, which is a marker of intervention feasibility (Achilles et al., 2020).

Table 1

Intervention modules and corresponding sections of the book Overcoming Perfectionism by

Shafran, Egan, and Wade (2018).

Module	Content	Module Activities	Location reference in Book
1	Understanding the expectations of the program, defining perfectionism, exploring the difference between high standards and perfectionism, exploring reasons to change	Activities in this module are in a text format and include identifying areas of life impacted by perfectionism and identifying barriers to change. Psychoeducation is provided in text and video format.	6 & 7 (64-65, 75-78, 80-89)
2	Understanding what keeps perfectionism going, personal maintenance cycle, introduce unhelpful thinking patterns	Activities include a video instructing participants on how to create a maintenance cycle. Downloadable and interactive questions allow participants to build a diagram of their own maintenance cycle.	5 & 7.7 (66-74, 172-175)
3	Conceptualising the cognitive behavioural model, defining unhelpful thinking styles, cognitive restructuring, conducting behavioural experiments	The cognitive behavioural model is introduced via two psychoeducational videos. Participants can complete two downloadable text-based exercises about changing personal rules into guidelines.	7.5, 7.7 (151-156, 178-180)
4	Understanding why people are self-critical, identifying the critical voice, identifying the	Activities include two psychoeducational videos on self-criticism and self-compassion and a	8 (221-236)

	compassionate voice, applying self-compassion through personal values	downloadable text-based activity on identifying self-criticism.	
5	Understanding how perfectionism can encourage procrastination, identifying triggers for procrastination, problem solving procrastination by breaking down tasks	Interactive activities include two psychoeducational videos on procrastination and a web-based activity on identifying areas for procrastination. Two downloadable text-based exercises are provided on perfectionistic beliefs which lead to procrastination and breaking down large tasks.	7.8 (185-195, 198, 205-206)
6	Exploring beliefs which underpin perfectionism, evaluating the truthfulness of these beliefs, conducting behaviour experiments to refute beliefs	Psychoeducation is provided in text and video format. Participants are able to access a downloadable PDF diary card for a behavioural experiment.	7.5, 7.8 (156, 211-214)
7	Creating a self-worth pie-chart, identifying the relationship between self-worth and achievement, consider and expand on areas of life not linked to achievement	Activities include psychoeducational videos and two downloadable text-based exercises for diversifying areas of self-worth.	9 (237-241, 248-251, 254-255
8	Recap of all previous sessions, relapse prevention, self-	The final session provides a PDF planner for maintaining progress.	7.9, 10 (216, 256-261)

| | reflection 'letter to future self' | Session recaps are in text and video format. |

Adherence

Adherence is defined as compliance with the recommended and intended use of a program, which is a marker of intervention feasibility (Achilles et al., 2020). Adherence for this program was defined as completion of two modules per week for four weeks, with an estimated completion time of 20 minutes per module. Frequency of program engagement was measured through website traffic information, survey time stamps, and self-report measures (e.g., *How many sessions have you completed to date?*). Time and date stamps, taken from survey responses, determined the frequency in which participants were completing the modules, as surveys could only be accessed from the final page of each module. This information was supplemented with data from the Visitor Analytics application installed on the intervention website (duration of each visit and the number of pages viewed per visit). This provided estimates as to how long participants spent accessing the intervention.

Indicative Effect Sizes

Due to the low completion rate of first cohort, a matched pairs t-test with effect size estimates (correcting for correlated observations) was conducted using only second cohort to examine changes between pre- and post-intervention scores for perfectionism and disordered eating using the software package IBM SPSS Statistics, Version 27. Perfectionism was measured using the Frost Multidimensional Perfectionism Scale subscales, *concern over mistakes* (9 items; $\alpha = 0.87$) and *personal standards* (7 items; $\alpha = 0.87$; Frost et al.,1990). Disordered eating was measured using the Eating Disorder 15 (ED-15; Tatham et. al., 2015) subscales; Weight and Shape Concerns (6 items; $\alpha = 0.92$) and Eating Concerns (4 items; $\alpha = $

0.89). Only participants in the second cohort completed the full ED-15 whereas the first cohort completed only the five behavioural items. Cronbach's alpha was calculated using data from the second cohort only. See **Chapter Four** for full a description of the included measures.

Qualitative Feedback

Participants were asked open-ended questions after each module regarding their most and least favourite parts, barriers to treatment, and suggested improvements. Qualitative information was coded into central themes using inductive analysis, as described by Braun and Clarke (2006), using the QSR software program NVivo (2020). Participants also rated sessions for enjoyment, relevancy, usefulness, satisfaction, and engagement (e.g. *How useful did you find this session?*) on a scale from 0 (*Not at all*) to 10 (*Very*). Participants' expectations (3 items; $\alpha = 0.89$) and perceived program credibility (3 items; $\alpha = 0.76$) was assessed using the Credibility Expectancy Questionnaire (Borkovec & Nau, 1972). Higher scores indicate greater program credibility and expected improvements in functioning from 0 (lowest rating) to 9 (highest rating).

Results

Participants

Baseline clinical characteristics from the two cohorts (summarised in **Table 2**) showed the first cohort were significantly older (odd ratio [OR]= 0.43, 95% confidence intervals [CI]: 0.26, 0.72) than Cohort 2, with higher levels of concerns over mistakes (OR=0.75, 95% CI: 0.59, 0.94) and personal standards, (OR=0.60, 95% CI: 0.43, 0.85). No other baseline differences were found.

Rates of Recruitment

The first cohort were recruited between April 2021 - August 2021, a rate of 2 participants per month. The second cohort were recruited between August 2021 - September 2021, a rate of 10.5 participants per month.

Retention

In the first cohort, attrition rates reached 80% by session 3, 90% by session 4 and 100% by session 8, with 60% of participants never accessing the intervention after enrolment. In the second cohort, attrition was 0% at session 4 and reached 4.8% by session 8. Participants were given access to all modules from their first log in, however, of those that accessed the intervention, 97% completed the modules in the prescribed chronological order.

Table 2

Baseline Demographic and Clinical Characteristics (Mean, SD)

Variable	Cohort 1 ($N = 10$)	Cohort 2 ($N = 21$)
Age (years)	23.3 (2.54)	19.0 (1.30)
Gender (n, %)	Female (10, 100%)	Female (21, 100%)
Race (n, %)	White (10, 100%)	African (1, 4.8%)
		Asian (3, 14.4%)
		White (17, 81%)
Country of residence (n, %)	Australia (10, 100%)	Australia (21, 100%)

Socioeconomic status	1045 (62)	1019 (55)
FMPS-CM	38.90 (4.31)	33.42 (4.82)
FMPS-PS	27.60 (2.22)	22.05 (3.72)
WCS	97.17 (22.42)	85.95 (19.35)
ED-15 EC	N/A	4.33 (1.36)
ED-15 WSC	N/A	4.95 (1.34)
Objective binge episodes previous week	1.60 (2.31)	1.81 (2.35)
Vomiting episodes previous week	0.33 (0.5)	0.19 (0.61)
Laxatives – times in previous week	0.89 (2.31)	0.00 (0.00)
Restriction –times in previous week	4.90 (2.96)	1.86 (2.06)
Exercise –times in previous week	3.00 (2.87)	1.71 (2.13)
CEQ-C	6.97 (1.58)	7.11 (1.05)
CEQ-E	6.1 (1.85)	6.78 (1.71)

Note: Socioeconomic status is assessed using the standardised Socioeconomic Indexes for Australia (SEIFA), whereby lower scores represent greater disadvantage, with the mean SEIFA score being 1000 with a standard deviation of 100, created from the five-yearly Census of Population and Housing 2016 data and consisting of four indexes: The Index of Relative Socio-Economic Disadvantage; The Index of Relative Socio-Economic Advantage and Disadvantage; The Index of Education and Occupation; The Index of Economic Resources. FMPS-CM = Frost's Multidimensional Perfectionism Scale-Concern over Mistakes subscale. FMPS-PS = Frost's Multidimensional Perfectionism Scale-Personal Standards subscale ED-15 WSC = ED-15 Weight Shape Concern subscale. ED-15 CC = ED-15 Cognitive concern subscale. WCS = Weight Concern Scale. CEQ-C = Credibility Expectancy Questionnaire-Credibility subscale. CEQ-E = Credibility Expectancy Questionnaire-Expectancy subscale.

Adherence

An analysis of survey response rates and website traffic in the second cohort indicated participants completed an average of three modules per week, completed the program in 26 days, spent 36 minutes per visit, and accessed 10 pages per visit.

Indicative Effect Sizes

Change over time was calculated for perfectionism (concern over mistakes and personal standards) and eating disorder symptoms (weight and shape concerns, and cognitive concerns) between pre- and post-intervention. Significant reductions were observed post-intervention for concerns over mistakes ($M = 27$, $SD = 6.99$), $d = 0.84$ (95% CI: 0.32, 1.35), weight and shape concerns ($M = 3.54$, $SD = 1.56$), $d = 0.67$ (95% CI: 0.18, 1.15), and cognitive concerns ($M = 3.38$, $SD = 1.58$), $d = 0.49$ (95% CI: 0.02, 0.95), but not for personal standards ($M = 19.37$, $SD = 4.94$), $d = 0.39$ (95% CI: -0.08, 0.85). No significant differences were found between pre- and post-intervention ratings of credibility ($M = 7.6$, $SD = 0.94$), $d = -0.28$ (95% CI: -0.72, 0.18), or expectations ($M = 7.03$, $SD = 1.77$), $d = -0.09$ (95% CI: -0.53, 0.35).

Participant Feedback

Themes were derived from four areas (favourite aspects, least favourite aspects, suggested improvements, barriers to treatment) and nine sub-themes corresponded to common references made within each theme. No major modifications were suggested for either content or website format (see **Table 3**). Ease of use, personal relevancy, and opportunities for self-reflection were reported as favourite aspects of the program. Suggested improvements included more engaging content, more opportunities for self-reflection, less reading, and more interactive multimedia elements. Being time poor was rated as the most common issue for not engaging further with the program. This barrier, coupled with feedback that content was too long, indicates future versions of this program should be shorter and less

content heavy to maximise participant engagement. The intervention was highly rated for enjoyment, satisfaction, usefulness, engagement, and relevancy (see **Table 4**). Credibility and expectations remained high over the intervention with average ratings ranging from 6.1-7.1.

Table 3

Theme Analysis of Participants' Qualitative Feedback of the Intervention

Theme	Examples
What was your favorite aspect of this session?	
Engaging content	Content provided new information; Content was easy to understand; Multimedia and visual content was easy to engage with
Personal development	Learning something new about self; Applying skills and techniques to life after the program; Conducting experiments to improve personal wellbeing; Understanding the factors which maintain perfectionism
Self-reflection	Completing exercises required self-reflection and thought; Reflecting on how content was relevant to personal experiences; Developing a greater understanding about own behaviours and habits
What was your least favorite aspect of this session?	
Unengaging content	Content was dry and heavy; Not enough videos; Paragraphs of text were too long; Too much writing required in the activities; Too much reading required
Not enough guidance	Not enough guidance about how to complete some of the exercises
	Lack of demonstrations for how activities or exercises should be carried out
	Further instruction needed about how to implement activities or techniques into daily life

Do you have any suggestions for how to improve the program?

More engaging content	Simplify some of the language used
	Incorporate more videos and interactive media
	Cut down the volume of text
	Condense the lengthier writing exercises
	Provide more opportunities for self-reflection
	Break text into smaller sections

Was there anything that prevented you from using the program more?

Other life commitments	Commitment to university studies and work
	Difficulty finding time in schedule to complete sessions
Losing content	Accidental loss of work due to website not having a save function
	Feeling frustrated when work is lost
Confrontational	Not wanting to admit to perfectionism being a problem
	Not wanting to reflect on painful personal insights
	Feeling self-critical or self-judgmental during self-reflections

Table 4

Average Ratings from Participant Feedback on a Scale from 0 (Lowest Rating) to 10 (Highest Rating)

Module	Satisfaction (*M, SD*)	Enjoyment (*M, SD*)	Usefulness (*M, SD*)	Engagement (*M, SD*)	Relevancy (*M, SD*)
1	7.6 (1.76)	7.3 (1.23)	8.0 (1.54)	7.5 (1.49)	8.4 (1.34)
2	7.1 (1.32)	6.8 (1.44)	7.3 (1.73)	7.3 (1.26)	8.1 (1.66)
3	7.5 (1.85)	7.2 (1.89)	7.6 (2.00)	7.5 (1.78)	8.1 (1.73)
4	7.9 (1.59)	7.7 (1.70)	8.0 (1.70)	8.0 (1.96)	8.5 (1.84)
5	8.0 (1.46)	7.8 (1.72)	8.3 (1.48)	7.6 (1.71)	8.5 (1.56)
6	8.5 (1.53)	8.6 (1.68)	8.6 (1.77)	8.4 (1.82)	8.6 (1.77)
7	8.5 (1.07)	8.4 (1.31)	8.5 (1.24)	8.4 (1.31)	8.9 (1.26)
8	8.9 (0.99)	8.8 (1.22)	8.5 (1.55)	8.3 (1.63)	8.5 (1.52)
Averages	8.0 (0.48)	7.8 (0.60)	8.1 (0.43)	7.9 (0.42)	8.5 (0.26)

Discussion

This study determines whether the intervention is feasible to be delivered on a larger scale based on recruitment, retention, adherence. This included feasibility of the measures (accessibility, length, and frequency) and of the intervention (relevancy, usefulness, and enjoyment), the rate of recruitment (length of recruitment time required) and attrition (how

many and how quickly participants disengaged). Indicative effect sizes were also examined to determine that they were consistent with findings from prior investigations.

Online interventions have the potential to be a valuable medium for providing easily accessible, cost-effective, and immediate psychotherapeutic help. Discovering key factors which impact end-users' likelihood to enrol in, engage with, and complete online interventions is imperative to their effectiveness and utility. Preliminary investigations, such as uncontrolled or pilot trials, help to inform larger scale studies as to user preferences, barriers to program engagement, implications of different recruitment methods, and program acceptability. Trials such as this offer considerations for future efficacy trials (conducted under optimal conditions) and effectiveness trials (conducted in uncontrolled real-world implementations).

Indicators of intervention feasibility were vastly different between the two cohorts, in terms of recruitment, retention, and the information available to infer program acceptability. Due to the 100% attrition in the first cohort, no end of treatment data was obtained despite participants being emailed an invite to provide feedback after the initial study period. The second cohort, however, adhered to the recommendation of two modules per week and spent an average of 36 minutes per visit. Two differences between these two cohorts may explain the disparity between the cohort outcomes. First, baseline differences were present between the cohorts, including a significantly higher level of perfectionism (personal standards and concerns over mistakes) in the first cohort. This finding is consistent with Vollert et al. (2019) who found online recruitment to be associated with higher symptom severity. As this previous research also indicates that higher symptom severity is associated with higher adherence to online interventions, it is unlikely this factor accounts for the stark difference in attrition between the first and second cohort.

The second difference, incentivisation, is then the primary candidate accounting for the difference in completion rates. The first cohort were given no incentivisation to participate in the online program whilst the second cohort participated in return for university course credit. This finding complements previous research that study adherence increases when incentives, both financial and non-financial, are offered (Abshire, 2017; Khadjesari, 2011; Gates, 2009; Booker, 2011). Since both cohorts were presented with the same online self-guided intervention, it would be reasonable to suggest that focus should be placed on exploring and utilising participant incentives to optimise engagement. The incentivisation of participants is considered ethically appropriate when equitable to the burden of the research and conforms to best practice as outlined in the guidelines by the National Health and Medical Research Council (*Payment Of Participants In Research: Information For Researchers, Hrecs And Other Ethics Review Bodies*, 2019). Efficacy trials, that require high study adherence to assess effect sizes under controlled conditions, should not overlook the role incentives play in allowing these studies to be conducted with sufficient power. Effectiveness trials, which address real-world application, may wish to consider how online interventions can be effectively and strategically offered to groups where incentivisation is possible, such as high school or university students, or individuals who have been waitlisted to receive psychotherapy. In addition, consideration can be given to providing guided interventions, shown to significantly increase adherence to online interventions for mental health problems (Musiat et al., 2021). Whilst such conditions may be necessary to ensure treatment efficacy can be investigated, the broader question of how to access and retain participants in an unrestricted online setting remains open for debate.

Based on findings from the second cohort, the effect size estimates are indicative of an effect in the desired direction (the reduction of symptom severity) which is similar to that obtained in larger samples (Kothari et al., 2019). There is a need, however, the examine the

effect sizes in a properly powered randomised controlled trial in participants who all have disordered eating. Participant feedback included only minor modifications to program layout and content, including reducing the volume of text, providing clearer instructions for self-guided activities, providing ample opportunities for self-reflection, allowing content to be downloadable and saveable. Overall, results suggest the intervention would be acceptable to participants if offered on a larger scale.

Limitations

There remains some uncertainty regarding intervention feasibility. Adherence pertains to the intentional usage of the program rather than simply the number of sessions completed. The intervention's host platform, Wix, is designed primarily for e-commerce and it was not possible to discern how long participants spent actively using the program, compared to how long they had their web browser open on the site. Similarly, the current measures could not determine participants' level of engagement (superficial or comprehensive) or whether skills and techniques were employed outside the sessions. Ideally, more sophisticated software is needed to record and analyse participant behaviours in relation to how they interact with the program. Further uncertainties around feasibility result from the lack of ethnic and gender diversity of the populations included in the study. The intervention was assessed on an entirely female, and predominantly Caucasian, population which limits the generalisability of these findings and the conclusions that can be drawn about intervention feasibility. Despite the inclusion criteria being open to all genders and hosted on an international platform, further research is needed to assess user preferences and barriers to treatment in more diverse populations.

Conclusion

Preliminary evidence from participants' engagement with, and feedback of, the FMP suggests the intervention is tolerable for users and acceptability may be enhanced with minor adjustments to the program. Due to the inherent imprecision of using a small sample size, more precise effect sizes need to be attained from a larger scale randomised study, which is the focus of the next chapter. Future studies also need to assess other symptoms, including depression and anxiety, to better understand the utility of the intervention. The results from the pilot study suggest that engagement may be enhanced by providing a form of incentivisation and by targeting at-risk, rather than clinical, populations. Further assessment in a diverse population and when utilising incentivisation strategies are needed to understand the feasibility of this intervention.

CHAPTER SIX: RANDOMISED CONTROL EVALUATION OF A PERFECTIONISM INTERVENTION[1]

[1] The study described in this chapter is detailed below and can be found in **Appendix B**. First author contributed 70% to the research design, 80% to data collection and analysis, and 80% to the writing and editing. Second author contributed 5% to the research design, 5% to data collection and analysis, and 5% to the writing and editing. Third author contributed 5% to the research design, 5% to data collection and analysis, and 5% to the writing and editing. Fourth author contributed 10% to the research design, 10% to data collection and analysis, and 10% to the writing and editing.

Abstract

Less help-seeking for an eating disorder is predicted by higher levels of denial of, and failure to perceive, illness severity. This research evaluates a "side-door" approach to early intervention by investigating whether internet cognitive behaviour therapy for perfectionism can significantly improve disordered eating. Additionally, we investigated whether a more interactive intervention impacted outcomes. Participants were recruited worldwide online; 368 were screened, 172 (46.7%) met inclusion criteria (endorsed high shape, weight, or eating concerns) and randomised to an interactive (Focused Minds Program; FMP) or static PDF intervention (Centre for Clinical Intervention; CCI-P) or waitlisted (control condition). Participants completed assessments on disordered eating, perfectionism, and a range of secondary variables at end of treatment, and 1- and 3-month follow-up. Intent-to-treat analyses indicated that, compared to control, FMP resulted in significantly lower levels of disordered eating at each assessment and CCI-P at the 1- and 3-month follow-up (respective 3-month follow-up between group effect sizes of 0.78 and 0.54). There were no significant differences between the two active interventions on any measure except depression and hated self. Results suggests an alternative approach to directly tackling disordered eating that is low-cost is effective, with a more interactive intervention producing a more rapid effect.

Low help-seeking behaviours are prevalent in eating disorders, even when compared to other mental health disorders such as depression and anxiety (Oakley Browne et al., 2006; Tillman & Sell, 2013). It has been suggested that interventions that do not directly target disordered eating but seek to reduce the perfectionism that is associated with it (Limburg et al., 2017) can provide a non-confrontational 'side-door' approach which may be more engaging than traditional treatment options (Balzan et al., 2023) whilst also being effective (Robinson & Wade, 2021).

The first aim of this randomised control trial (RCT) was to investigate if targeting perfectionism using an internet self-guided internet Cognitive Behaviour Therapy (CBT) intervention can reduce ED symptoms in a non-clinical sample of young adults. Young adults were chosen as the target audience for this intervention due to the strong association between the emergence of eating disorders and this age group. Almost half (49%) of all cases of anorexia nervosa emerge over the age range of 19 to 24 years (Grilo & Udo, 2021) and binge-purge disorders increase in prevalence from adolescence to age 25 years (Hudson et al., 2007). Higher scores of perfectionism have been associated with poorer outcomes for eating disorder treatment, suggesting it warrants intervention to facilitate ED recovery (Nilsson et al., 2008). In this RCT we predict significant improvements in disordered eating, wellbeing, self-criticism, and negative affect (depression, anxiety, and stress) following participation in a perfectionism intervention.

The second aim is to examine whether a more interactive intervention can improve outcomes. Previous work has compared two internet interventions with identical content (Linardon et al. , 2022) but having interactive versus static format; drop out was reportedly higher in the latter than the former, but no significant differences were found between the two groups for adherence rates or symptom reduction. In the current study, the content,

129

commitment time, and length are comparable between the two interventions while the delivery format (webpages versus PDF) varies significantly. Given the impact of more interactive formats on drop out which may impact clinical outcome, we predict better outcomes for the web-based than the PDF version of CBT.

Methods

Ethics and Trial Registration

Approval was received from the Flinders University Humans Research Ethics Committee (project number 5918). This study was prospectively registered with the Australian New Zealand Clinical Trials Registry (trial registration number ACTRN12621001448831).

Interventions

***Focused Minds Program* (FMP; https://www.focusedmindsprogram.com/)**

The proposed intervention was a self-guided online program with content adapted from the book *Overcoming Perfectionism: A self-help guide using Cognitive Behavioural Techniques* by Shafran, Egan, and Wade (2010). The program, titled the *Focused Minds Program* (FMP), consists of eight modules designed to take 20 minutes each to complete. Each session includes multimedia content, downloadable worksheets, and psychoeducation on an aspect of perfectionism. A summary of the intervention content can be found in Chapter Two. This RCT builds on a previous pilot trail, discussed in Chapter Two, which assessed the FMP for user acceptability. Modifications to the program were made following participant feedback with the intention to maximise user engagement in future trials. Modifications to the program included reducing the amount of text, increasing the number of multimedia elements, and creating more downloadable content.

Perfectionism Modules Created by the Centre for Clinical Interventions (CCI-P)

The CCI-P intervention (https://www.CCI-P.health.wa.gov.au/Resources/Looking-After-Yourself/Perfectionism) comprises nine modules; one was removed (*Reducing my Perfectionist Behaviour*) to ensure equal length of the intervention groups. Psychoeducation, worksheets, and suggested activities were included in a PDF format downloadable from the FMP website.

Participants

Participants were recruited through the global recruitment site Prolific (https://www.prolific.co/). Prolific was chosen as the most appropriate platform as it provides the ability to pay participants on a pro rata basis and provides access to a community sample of a select demographic group. Prolific is a recruitment platform with a global online audience who have (by signing up for the site) demonstrated a willingness and motivation to be involved in research. Screening questions can be used to target particular audiences within Prolific (such as young adults with shape and weight concerns). Participants completed an eligibility screener, read the participant information sheet, and provided online consent prior to receiving access to the baseline survey. Eligibility criteria was English fluency, aged 17-25 years old, reliable internet access, and current shape, weight, or eating concerns (scoring >46 on the 5-item Weight Concern Scale [Killen et al, 1993] which indicates significantly increased risk of developing an ED [Jacobi et al., 2011]). Exclusion criteria was currently engaged with treatment of an ED or ED concerns. The proposed study shall pre-emptively recruit participants with the expectation that approximately 40% will drop-out prior to the end of the study. Participants were reimbursed at a rate of £9GBP per hour (approximately £1.20 per survey), a total of $17AUD (£10GBP) across a 4-month period. Reimbursement

was only given for survey completion to ensure equal pay for participants and to mitigate the risk of engagement bias.

Power Analysis

A priori power was calculated (Hedeker et al., 1999) using a two-sided test, alpha of 0.05, and a power level of 0.80. Estimated effect size of 0.40 and estimated attrition of 30% by end of treatment was chosen based on a previous RCT with similar methodology (Shu et al., 2019). A sample size of 55 participants per group (165 participants total) was required.

Procedure

Baseline measures and demographic information were collected prior to participant randomisation. Demographic information included ethnicity (*Please describe your race or ethnicity*), country of residence (*Please enter your country of residence*), age (*Please enter your age in numbers*), and gender (*Please select your gender: male, female, non-binary, other*). Randomisation and data collection was conducted through the online survey platform Qualtrics. Participants who were randomised to an intervention group were emailed login details and recommended to complete two modules per week for the first four weeks. Participants were invited to complete weekly surveys for four weeks, a one-month follow-up, and a three-month follow-up. Following the three-month follow-up, all participants were provided access to the *Focused Minds Program*. Participants were only provided with technical support for the interventions or using Prolific, with no other support offered over the intervention.

Measures

See **Chapter Four** for a full description of the measures used.

Primary Outcomes

The ED15 (Tatham et al., 2015) is a 15-item questionnaire assessing disordered eating over the last week. Ten items address weight and shape (e.g. *[I] felt distressed about my weight*) and eating concerns (e.g. *[I] worried about losing control over my eating*). Five items address ED behaviours (e.g., laxative use, restriction, bingeing). Internal consistency for the first 10 items was strong, Cronbach's alpha =.88.

Two subscales were chosen from the 35-item Frost Multidimensional Perfectionism Scale (FMPS; Frost et al., 1990), the Concern over Mistakes subscale (nine items) and the Personal Standards subscale (seven items). Internal consistency (Cronbach's alpha) in the current study was .89 and .83 for respectively.

Secondary Outcomes

The 22-item Forms of Self-criticism/Self-reassurance scale (FSCRS; Gilbert et al., 2004) measures two forms of self-criticism (self-hatred and self-inadequacy) as well as self-reassurance (Gilbert et al., 2004). In the current study, Cronbach's alpha was 0.87, 0.92 and 0.93 respectively.

The 21-item Depression, Anxiety, and Stress Scale-Short Form (DASS-21; Lovibond & Lovibond, 1995) uses a 4-point Likert scale from 0 (*Did not apply to me at all*) to 3 (*Applied to me very much, or most of the time*). Higher scores indicate greater symptom severity. In this study Cronbach's alphas were high; .91 for depression, .83 for anxiety, and .86 for stress.

The 14-item Warwick-Edinburgh Mental Well-Being Scale (WEMWBS; Tennant et al., 2007) measures a single construct of mental wellbeing with items scored from 1 (*None of*

the time) to 5 (*All of the time*). It has high test-retest reliability (0.83; Tennant et al., 2007). In the current study, Cronbach's alpha was 0.93.

The 6-item Credibility-Expectancy Questionnaire (CEQ; Devilly & Borkovec, 2000) loads on two factors; treatment credibility and expectancy of effectiveness of the therapy. Respective Cronbach's alphas were .87 and .73.

Data Analysis

Logistic regression was used to determine whether demographic (gender or age) or baseline variables (CEQ, FMPS, DASS-21, FCRS, ED15, WEMBS) predicted missingness amongst the longitudinal data. Variables were scored if <10% of variable items were missing. A binary variable was created to categorise participants who were not missing data (<10%) and those missing at least one scored variable (>10% of items missing). The binary missingness variable was entered as a dependent variable in the model. All baseline measures and age (Step 1) and gender (Step 2) were added as covariates. Hosmer and Lemeshow's test determined goodness of model fit.

Linear Mixed Models

Intent to treat (ITT) analysis was conducted using all 172 randomised participants and completers analysis was conducted using 109 participants. Completers were defined as any participant who attempted at least one module from the FMP or CCI-P intervention, all participants from the control group were included in the completers analysis. Linear mixed models (LMMs) were conducted using both completer and ITT data. LMMs were performed using an unstructured covariance structure, restricted maximum likelihood estimations to handle missing data, and Bonferroni adjustments to account for repeated measures. Baseline dependent variables, group, time, and group*time interactions were included as fixed effects,

hence both between group effects and interactions were of interest to indicate significant differences between the groups. LMMs were conducted for all dependent variables except CEQ, due to the lack of control group data for this measure. An independent samples t-test was performed instead comparing CCI-P and FMP groups at mid-point (week 2) and at end of treatment (week 4) for treatment credibility and expectancy. Estimated means and standard errors were calculated for control, CCI-P, and FMP groups using completer and ITT data. Between-group Cohen's *d* were calculated using the Campbell Collaboration tool (https://www.campbellcollaboration.org/research-resources/effect-size-calculator.html) based on these estimates.

Engagement Data Analysis

Engagement data were analysed using data available from all survey responders in the CCI-P group (*n* = 54) and the FMP group (*n*= 40). Total number of modules completed was estimated from the question "How many modules have you completed to date?" Weekly tallies were summed and divided by the number of survey responders to calculate an average number of modules completed across the 4-week treatment period. Average duration spent completing each module was estimated from the question "What percentage of the modules did you complete?". Module completion was averaged across the total number of corresponding responses for each intervention. Average percentage of each module attempted was addressed using 4 options to answer "How long did you spend completing each module?"; Under 10 minutes. 10-20 minutes, 20-30 minutes, over 30 minutes. Calculating the average time per module was not feasible due to participants' categorical responses. Time spent per module was instead determined from the majority (mode) of responses.

Results

Participant Flow and Demographics

Online recruitment occurred over a three-day period (2nd-5th September 2022) across 21 countries. Of the 368 participants screened, 172 (46.7%) met the inclusion criteria and were randomised into the study. By end of treatment (week 4), attrition reached 36% for the FMP group, 33% for the CCI-P group, and 12% for the control group. See **Figure 1** for CONSORT diagram of participant flow through the study. The sample population identified as female (50.6%), male (45.9%), and non-binary/other (2.3%), with a mean age of 22.6 years (*SD* 1.99). Average baseline ED-15 score was 3.61 (*SD* 1.09) for females and 2.99 (*SD* 1.06) for males, indicating elevated shape, weight, and eating concerns in this population compared to a community sample of 2.05 (*SD* 1.33) for females and 1.31 (*SD* 1.15) for males (Tatham et al, 2015). See **Table 1** for participant demographic information.

Figure 1

CONSORT diagram
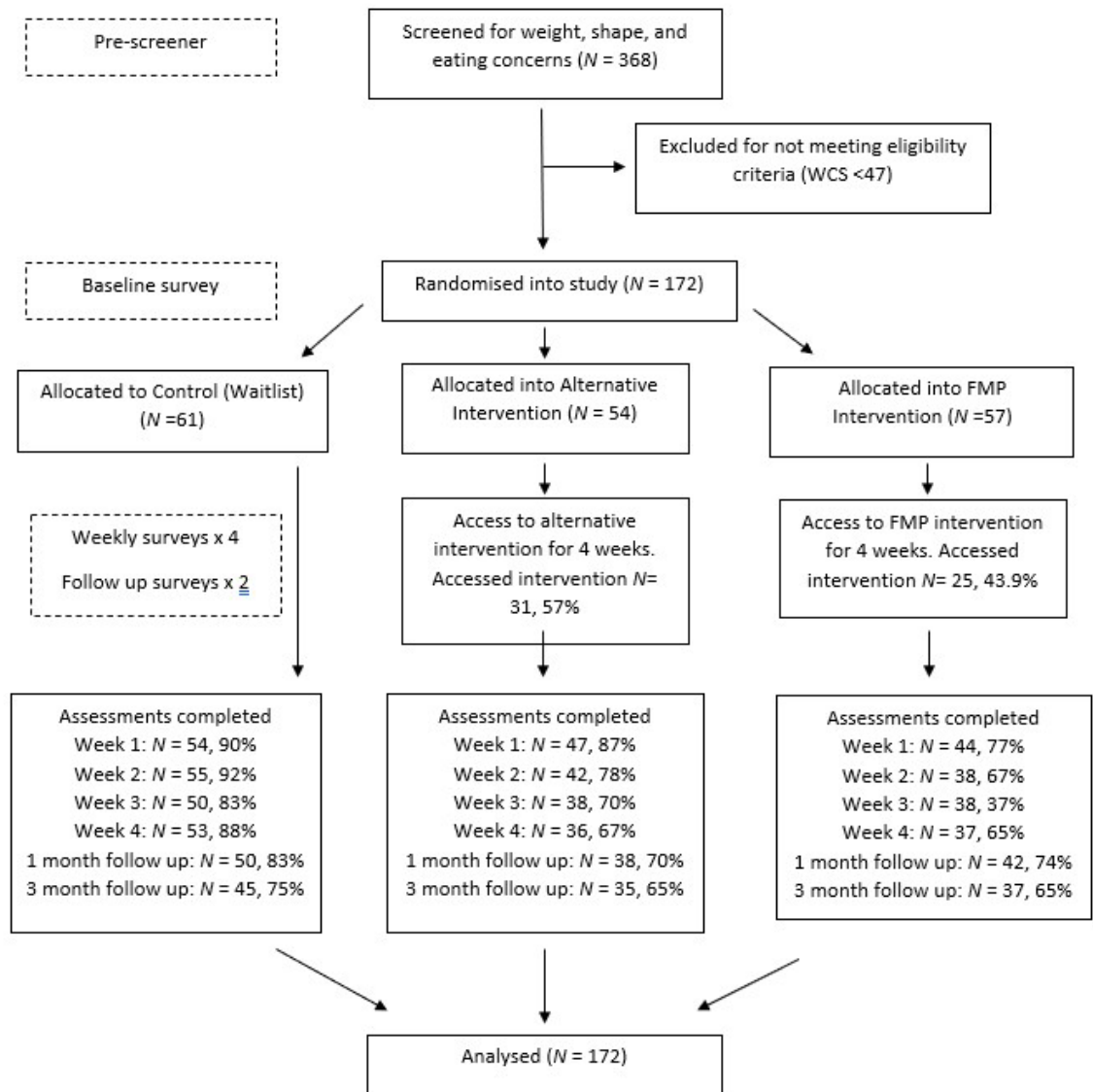
Table 1

Demographic Information and Baseline Measures

Demographics	Entire Sample *M, SD* (*N*= 172)	FMP Intervention *M, SD* (*N*= 57)	CCI Intervention *M, SD* (*N*= 54)	Control *M, SD* (*N*=61)
Age	22.6 (*Range*: 18-28)	22.3 (18-25)	22.7 (18-28)	22.7 (19-25)
Gender	F:87; M:79; X:4	F: 28; Male: 27; X: 1	F:26; M:26; X:2	F: 33; M: 26; X: 1
Country of residence	Australia: 12	5	5	2
	Austria:1		1	
	Belgium: 1		1	
	Canada:2	1	1	
	Chile: 2		2	
	France: 1		1	
	Israel:1			1
	Italy: 6	1	2	3
	Mexico: 12	4	1	7
	Netherlands: 1	1		
	New Zealand: 2	1		1
	Ireland: 1			
	Poland: 7	2	1	4
	Portugal: 4		1	3
	South Africa: 21	7	7	7
	Spain: 1	1		
	United Kingdom: 22	10	7	6
	United States: 75	23	25	27

Ethnicity	African: 21	7	6	8
	Asian: 22	8	8	6
	Black: 5	1	2	2
	Caribbean: 1	1		
	White: 84	26	30	28
	Hispanic: 24	8	5	11
	Latino: 4	1	1	2
	Indian: 1			1
	Middle Eastern: 1	1		
	Mixed race: 7	2	2	3
	Pakistani: 1	1		
	Slavic: 1		1	
	Turkic: 1	1		
Eating and Weight Concerns	3.30 (1.12)	3.23 (1.23)	3.17 (1.04)	3.49 (1.09)
Binge episodes	1.80 (2.37)	1.47 (1.64)	1.87 (1.99)	2.05 (3.14)
Purge episodes	0.36 (2.57)	0.11 (0.45)	0.64 (4.05)	0.36 (1.95)
Laxative use episodes	0.11 (0.50)	0.04 (0.19)	0.13 (0.43)	0.16 (0.71)
Restriction episodes	3.27 (3.39)	3.80 (3.69)	3.11 (3.88)	2.92 (2.53)
Exercise	2.08 (2.47)	2.68 (2.52)	1.65 (2.80)	1.90 (2.01)
Anxiety	6.64 (4.61)	7.42 (5.14)	6.85 (4.77)	5.71 (3.77)
Depression	8.53 (5.45)	8.04 (5.83)	10.18 (5.58)	7.49 (4.64)
Stress	8.98 (4.73)	9.05 (5.29)	9.51 (4.36)	8.42 (4.50)
Expectancy	4.82 (1.92)	4.78 (2.08)	4.70 (1.89)	4.97 (1.82)
Credibility	5.77 (1.51)	5.82 (1.46)	5.67 (1.58)	5.81 (1.49)
Inadequate	21.45 (8.41)	20.63 (8.20)	22.27 (8.39)	21.46 (8.68)

Reassurance	14.43 (7.80)	16.68 (7.74)	12.95 (7.66)	13.00 (7.64)
Hated Self	6.33 (5.41)	5.49 (5.37)	6.76 (4.93)	6.72 (5.83)
Concern over Mistakes	29.40 (7.39)	28.67 (6.50)	29.81 (7.55)	29.72 (8.06)
Personal Standards	25.58 (4.81)	26.19 (4.98)	24.8 (4.80)	25.69 (4.65)
Wellbeing	41.49 (10.28)	43.89 (11.00)	39.75 (10.53)	40.80 (9.07)

Note. F= Female, M =Male, X= Non-binary/Other, ED15= Eating Disorder 15

Missing Data

Age, gender, and baseline variables were all non-significant in predicting data missingness, indicating that the data was missing at random. Model fit did not significantly improve with the addition of covariates in the regression model (X^2= 12.58, *p*= .56). A non-significant result for Hosmer and Lemeshow's test (X^2= 8.42, *p* = .39) indicates model fit was acceptable.

Intent to Treat Analysis

Linear Mixed Models

The estimated means and SE for all groups across the time points is shown in Table 2. In the intent to treat analysis, a main effect of time indicated that all groups experienced improvements in disordered eating and self-criticism scores. A main effect of group was found for disordered eating, perfectionism, self-criticism, depression, anxiety, and stress. A significant time by group interaction was found for personal standards and anxiety, where both intervention groups decreased more steeply than the control group over time (see

Figures 2 and 3). The only outcome variable to show neither a significant main nor

interaction effect was wellbeing.

Table 2

Estimated Means (M) and Standard Errors (SE) at End Of Treatment and Follow-Up, Controlling for Baseline Dependent Variables for Intent to Treat Group (N=172).

Variables	Baseline Covariate	Baseline *M (SE)*			End of Treatment *M (SE)*			One-month follow-up *M (SE)*			Three-month follow-up *M (SE)*		
		FMP	CCI	Control	FMP	CCI	Control	FMP	CCI	Control	FMP	CCI	Control
Disordered eating	3.30	3.22 (0.16)	3.17 (0.14)	3.49 (0.14)	2.13 (0.16)	2.49 (0.16)	2.77 (0.14)	1.89 (0.16)	1.89 (0.16)	3.01 (0.14)	2.00 (0.18)	2.32 (0.18)	3.01 (0.16)
Depression	8.40	8.04 (0.77)	10.18 (0.75)	7.49 (0.59)	5.91 (0.60)	7.81 (0.61)	8.16 (0.52)	5.72 (0.53)	6.71 (0.55)	8.06 (0.48)	6.11 (0.66)	7.64 (0.68)	8.67 (0.60)
Anxiety	6.46	7.42 (0.68)	6.85 (0.64)	5.70 (0.48)	5.40 (0.52)	5.70 (0.52)	6.30 (0.44)	5.05 (0.46)	5.30 (0.47)	6.53 (0.41)	4.39 (0.59)	6.01 (0.61)	7.44 (0.54)
Stress	8.87	9.05 (0.70)	9.51 (0.59)	8.43 (0.58)	6.50 (0.54)	7.54 (0.55)	9.22 (0.46)	6.80 (0.52)	7.30 (0.54)	8.32 (0.47)	6.00 (0.66)	7.36 (0.68)	9.62 (0.60)

Inadequate	21.61	20.63	22.27	21.46	18.56	19.57	21.35	18.46	17.53	21.00	16.81	18.83	21.86
		(1.08)	(1.13)	(1.11)	(0.87)	(0.87)	(0.74)	(0.92)	(0.94)	(0.83)	(1.04)	(1.06)	(0.94)
Reassure	14.50	16.68	12.95	13.67	15.55	16.50	14.88	16.65	16.95	15.80	16.71	17.30	15.62
		(1.03)	(1.03)	(0.98)	(0.68)	(0.68)	(0.58)	(0.75)	(0.76)	(0.67)	(0.94)	(0.96)	(0.85)
Hated Self	6.46	5.49	6.76	6.72	5.61	6.08	6.66	5.37	5.74	6.51	5.56	7.30	7.21
		(0.71)	(0.66)	(0.75)	(0.48)	(0.48)	(0.41)	(0.45)	(0.47)	(0.41)	(0.59)	(0.60)	(0.53)
Concern over mistakes	29.66	28.67	29.81	29.72	26.18	27.34	28.84	25.88	26.73	28.98	25.99	27.76	29.43
		(0.86)	(1.03)	(1.03)	(0.97)	(0.98)	(0.84)	(0.92)	(0.95)	(0.83)	(0.98)	(1.00)	(0.88)
Personal standards	25.83	26.19	24.81	25.69	23.79	25.02	26.13	24.65	23.75	25.68	24.31	24.67	25.82
		(0.66)	(0.66)	(1.16)	(0.56)	(0.58)	(0.48)	(0.54)	(0.56)	(0.49)	(0.61)	(0.63)	(0.55)
Wellbeing	41.48	43.89	39.75	40.80	44.24	40.89	41.35	44.22	42.34	40.72	43.75	42.04	40.55
		(1.45)	(1.42)	(1.16)	(1.28)	(1.29)	(1.10)	(1.20)	(1.22)	(1.08)	(1.46)	(1.48)	(1.32)

Figure 2 and 3

Significant Interactions from Intent to Treat Analysis, Covarying for Baseline Variables
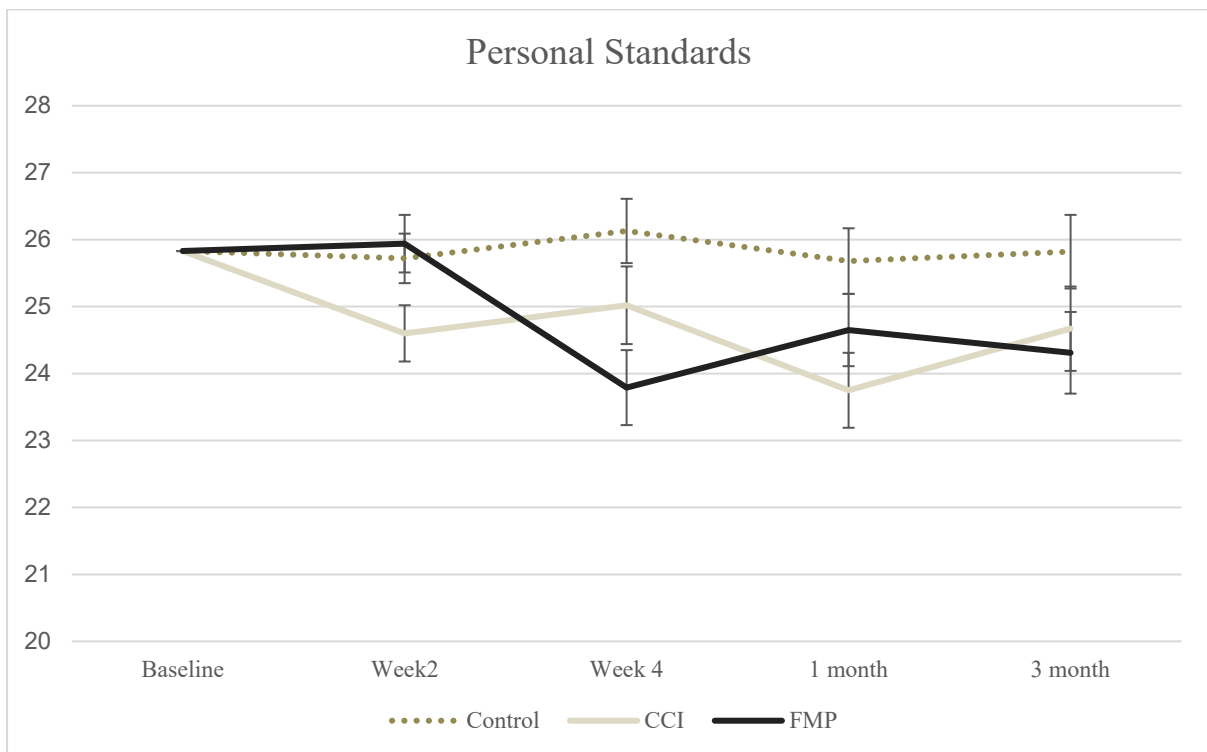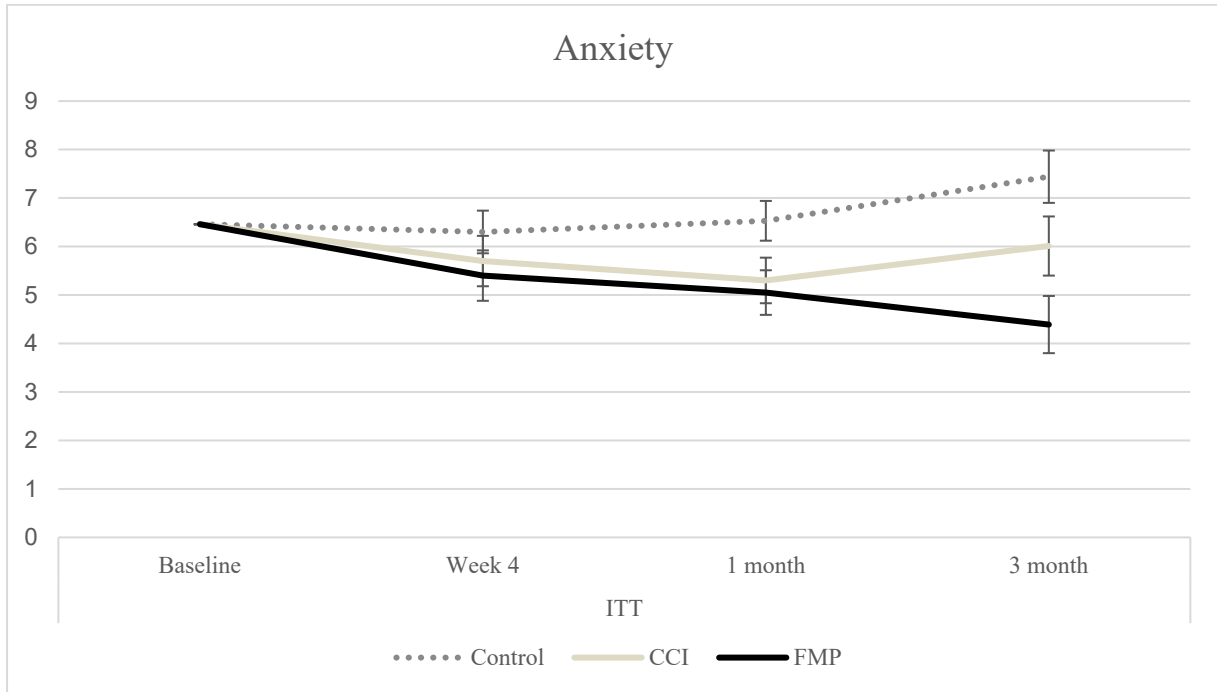
Effect Sizes

The FMP intervention performed significantly better than the control condition for disordered eating, depression, stress, inadequacy, concern over mistakes, and personal standards at the end of treatment (See **Table 3**). In contrast, the CCI-P intervention only significantly outperformed the control condition on stress. The two active interventions did not perform significantly differently on any measure except the FMP showed a greater reduction in depressive symptoms than the CCI-P.

For the FMP intervention, effects were maintained at one-month follow-up for all variables except personal standards. Additionally, a significant difference in wellbeing was present between the FMP and control condition. For the CCI-P intervention, a greater number of significant effects were present at follow-up than at the end of treatment and it significantly outperformed the control condition for disordered eating, anxiety, inadequacy, and the personal standards. No significant differences emerged between the two interventions at one-month follow-up.

At three-month follow-up, significant effects were maintained between the FMP and control condition for eating, depression, anxiety, stress, inadequacy, self-hatred, and concern over mistakes. For the CCI-P, significant effects were maintained for eating, stress, and inadequate self. FMP outperformed CCI-P for self-hatred.

Post-hoc Analysis

A post-hoc analysis was conducted for the CCI-P intervention group to examine a potential mediation pathway for the reduction in disordered eating symptoms seen at 3-month follow-up, despite the lack of significant change in perfectionism in this group. Simple linear regression was conducted on all three possible predictors; variables which showed a

145

significant change between the CCI-P and control group at 1-month follow-up. Regression

analyses were conducted for inadequacy, anxiety, and personal standards. None of the

variables significantly predicted disordered eating at 3-month follow-up, however,

inadequacy approached significance (see **Table 4**).

Table 3

Intent To Treat Analysis Between-Group Effect Sizes with 95% Confidence Intervals, Based On Estimated Means and Standard Errors at End Of Treatment

Variable	End of treatment			One-Month follow-up			Three-month follow-up		
	FMP vs CCI-P	CCI vs Control-P	FMP vs Control	FMP vs CCI-P	CCI-P vs Control	FMP vs Control	FMP vs CCI-P	CCI-P vs Control	FMP vs Control
Disordered eating	-0.31	-0.25	-0.56	-0.31	-0.67	-0.98	-0.24	-0.54	-0.78
	-0.68, 0.07	-0.62, 0.12	-0.93, -0.19	-0.69, 0.06	-1.04, -0.29	-1.36, -0.60	-0.61, 0.13	-0.91, -0.17	-1.16, -0.41
Depression	-0.43	-0.08	-0.53	-0.25	-0.35	-0.61	-0.31	-0.21	-0.53
	-0.80, -0.05	-0.45, 0.28	-0.90, -0.16	-0.62, 0.13	-0.72, 0.02	-0.98, -0.24	-0.68, 0.07	-0.58, 0.15	-0.90, -0.17
Anxiety	-0.08	-0.17	-0.25	-0.07	-0.37	-0.45	-0.37	-0.33	-0.71
	-0.45, 0.29	-0.53, 0.20	-0.61, 0.12	-0.45, 0.30	-0.74, -.004	-0.81, -0.08	-0.74, 0.01	-0.70, 0.04	-1.08, -0.34
Stress	-0.26	-0.44	-0.72	-0.13	-0.27	-0.40	-0.28	-0.47	-0.76
	-0.63, 0.12	-0.82, -0.07	-1.09, -0.34	-0.50, 0.24	-0.64, 0.10	-0.77, -0.04	-0.65, 0.10	-0.84, -0.10	-1.13, -0.38

Inadequate Self	-0.16	-0.30	-0.46	0.14	-0.52	-0.38	-0.26	-0.40	-0.67
	-0.53, 0.22	-0.66, 0.07	-0.82, -0.09	-0.24, 0.51	-0.90, -0.15	-0.75, -0.02	-0.63, 0.11	-0.77, -0.03	-1.04, -0.30
Reassure	-0.18	0.34	0.14	-0.05	0.21	0.16	-0.08	0.25	0.16
	-0.55, 0.18	-0.03, 0.71	-0.22, 0.50	-0.43, 0.32	-0.15, 0.58	-0.20, 0.52	-0.46, 0.29	-0.12, 0.62	-0.20, 0.52
Hated Self	-0.13	-0.17	-0.31	-0.11	-0.23	-0.35	-0.40	0.02	-0.39
	-0.51, 0.24	-0.54, 0.19	-0.67, 0.05	-0.48, 0.26	-0.60, 0.13	-0.71, 0.02	-0.77, -0.02	-0.35, 0.39	-0.75, -0.02
Concern over mistakes	-0.16	-0.22	-0.39	-0.12	-0.34	-0.47	-0.24	-0.24	-0.49
	-0.54, 0.21	-0.59, 0.15	-0.75, -0.02	-0.50, 0.25	-0.71, 0.03	-0.83, -0.10	-0.62, 0.13	-0.60, 0.13	-0.85, -0.12
Personal Standards	-0.29	-0.28	-0.59	0.22	-0.49	-0.26	-0.08	-0.26	-0.34
	-0.67, 0.08	-0.65, 0.09	-0.96, -0.22	-0.15, 0.60	-0.86, -0.12	-0.63, 0.10	-0.45, 0.29	-0.63, 0.11	-0.71, 0.02
Wellbeing	0.35	-0.05	0.32	0.21	0.19	0.40	0.16	0.14	0.30
	-0.02, 0.73	-0.42, 0.32	-0.04, 0.68	-0.16, 0.58	-0.18, 0.56	0.04, 0.77	-0.22, 0.53	-0.22, 0.51	-0.06, 0.67

Table 4

Regression Analysis Summary for Predictors of Change in Disordered Eating Symptoms in CCI-P Intervention Group at 3-Month Follow-Up

Variable (change one-month follow-up)	B (95% CI)	SE	β	*t*	*p*
Anxiety	-0.10 (-0.24, 0.03)	.07	-0.23	-1.56	.133
Personal Standards	-0.07 (-0.18, -0.04)	.05	-0.21	-1.29	.208
Inadequacy	-0.06 (-0.12, -0.001)	.03	-0.32	-2.02	.055

Completers Analysis

Linear Mixed Models

The estimated means and SE for all groups across all time points is shown in Table 5. A main effect of group was found for all outcome measures (depression, stress, anxiety, disordered eating, self-criticism, wellbeing, and perfectionism) indicating group assignment significantly impacted participant outcomes. A main effect of time was found for disordered eating and self-criticism (all subscales), indicating all three groups saw improvements in their disordered eating and self-criticism scores over time. A significant time by group interaction was found for the disordered eating and inadequacy, both present with similar interaction

models. Both the FMP and CCI-P show a similar trajectory with comparable rates of change, whereas the control condition for both interactions exhibit minimal to no slope (see **Figures 4 and 5**).

Table 5

Completer Analysis Estimated Means (and Standard Errors) at End of Treatment and Follow-Up Controlling for Baseline Dependent Variables

Variables	Baseline Covariate	Baseline *M (SE)*			End of Treatment *M (SE)*			One-month follow-up *M (SE)*			Three-month follow-up *M (SE)*		
		FMP	CCI	Control	FMP	CCI	Control	FMP	CCI	Control	FMP	CCI	Control
Disordered eating	3.30	3.00 (0.21)	3.23 (0.17)	3.46 (0.15)	2.03 (0.22)	2.28 (0.20)	2.81 (0.14)	1.62 (0.22)	1.98 (0.20)	3.05 (0.14)	1.67 (0.24)	2.17 (0.22)	3.05 (0.16)
Depression	7.85	7.84 (1.10)	8.74 (0.91)	7.72 (0.66)	4.18 (0.82)	6.22 (0.75)	7.92 (0.53)	4.63 (0.70)	5.09 (0.63)	7.68 (0.45)	5.24 (0.89)	6.25 (0.85)	8.12 (0.61)
Anxiety	6.41	7.60 (0.92)	6.87 (0.83)	5.68 (0.52)	4.75 (0.69)	5.20 (0.63)	6.30 (0.45)	4.88 (0.62)	4.41 (0.56)	6.66 (0.40)	4.47 (0.83)	5.33 (0.79)	7.31 (0.56)
Stress	8.64	8.84 (0.96)	9.06 (0.75)	8.45 (0.63)	5.24 (0.73)	6.58 (0.66)	8.98 (0.47)	6.43 (0.65)	5.77 (0.59)	8.18 (0.42)	6.17 (0.88)	7.16 (0.83)	9.59 (0.60)
Inadequate	20.72	19.08 (1.72)	21.42 (1.36)	21.25 (1.22)	16.12 (1.13)	17.26 (1.04)	20.50 (0.74)	16.34 (1.28)	14.80 (1.17)	20.15 (0.85)	15.25 (1.46)	16.87 (1.34)	21.10 (0.99)
Reassure	15.22	18.08 (1.67)	15.61 (1.28)	13.70 (1.12)	17.62 (0.89)	18.31 (0.82)	15.45 (0.57)	19.39 (1.01)	18.25 (0.93)	16.42 (0.67)	19.57 (1.28)	18.75 (1.18)	16.17 (0.87)
Hated Self	5.99	4.72 (0.95)	5.81 (0.84)	6.70 (0.80)	4.43 (0.59)	4.82 (0.55)	6.34 (0.39)	4.28 (0.57)	4.27 (0.53)	6.13 (0.38)	3.95 (0.76)	6.55 (0.70)	6.90 (0.52)
Concern over mistakes	29.15	27.68 (1.35)	29.00 (1.34)	26.00 (0.65)	25.50 (1.27)	24.01 (1.20)	28.30 (0.81)	1.62 (0.22)	1.98 (0.20)	3.05 (0.14)	25.41 (1.32)	25.10 (1.25)	28.96 (0.90)
Personal standards	26.00	25.84 (1.06)	25.45 (0.87)	25.96 (0.65)	24.75 (0.77)	24.62 (0.75)	26.22 (0.50)	4.63 (0.70)	5.09 (0.63)	7.68 (0.45)	25.08 (0.81)	24.46 (0.77)	25.91 (0.55)
Wellbeing	42.00	45.76 (2.06)	42.94 (1.77)	40.09 (1.30)	47.13 (1.75)	43.11 (1.58)	41.94 (1.14)	4.88 (0.62)	4.41 (0.56)	6.66 (0.40)	45.61 (1.94)	44.66 (1.84)	40.96 (1.13)

Note: FMP (N = 25), CCI-P (N = 31), Control (N = 53).

Figure 4 and 5

Significant Interactions from Completers Analysis, Covarying for Baseline Variables
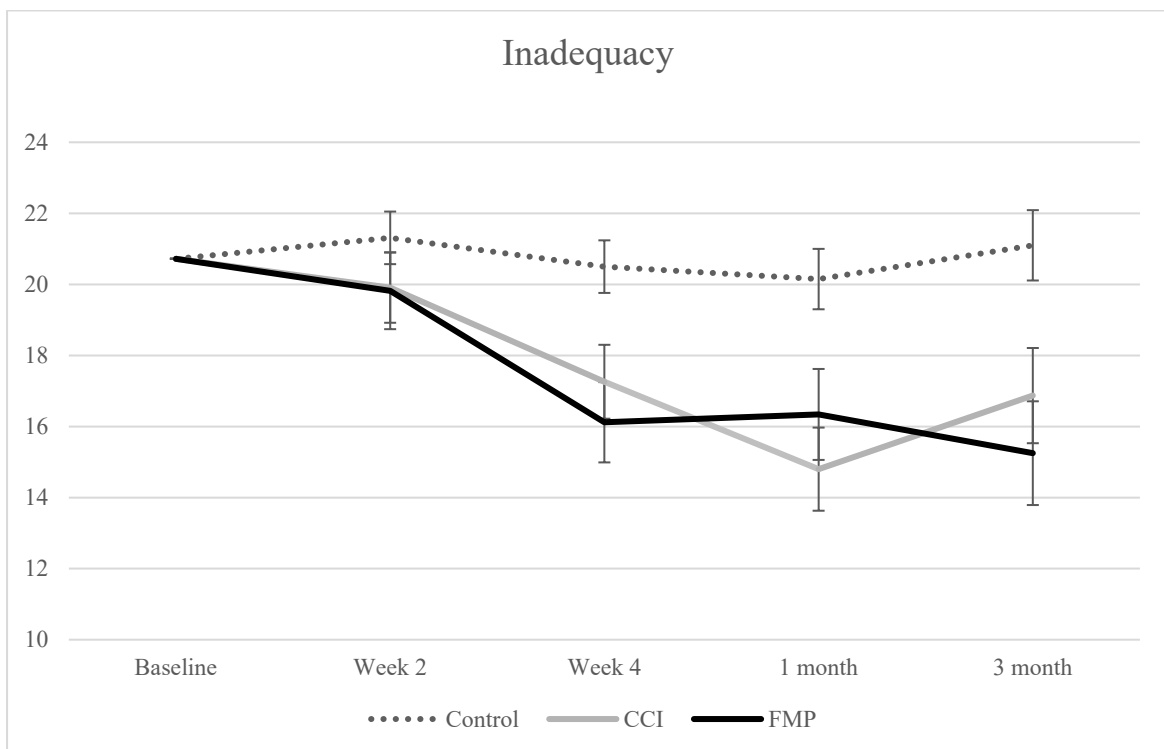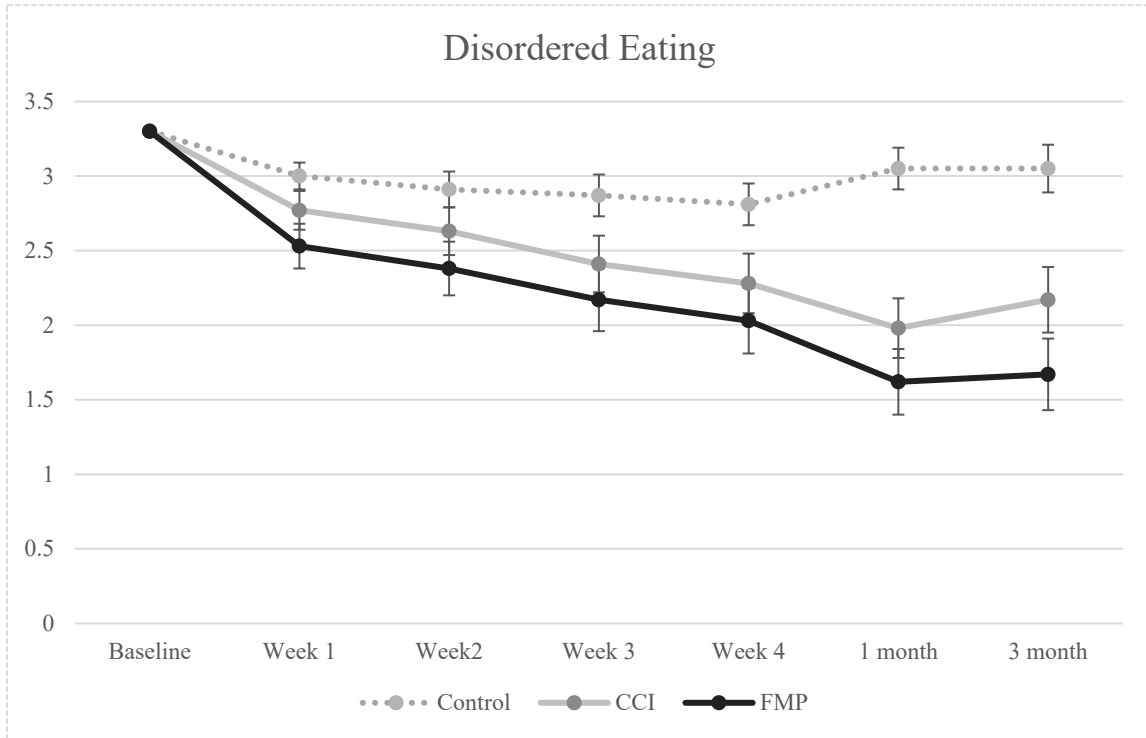
Effect Sizes

At end of treatment, the FMP intervention performed significantly better than the control condition for disordered eating, depression, stress, self-criticism, and wellbeing (see **Table 6**). The FMP did not perform differently to the control condition on either of the perfectionism subscales. In contrast, the CCI-P intervention performed significantly better than the control for disordered eating, stress, self-criticism, and concern over mistakes. Whilst the completers analysis showed a greater number of significant effects between the CCI-P intervention and the control condition than in the intent to treat analysis, effect sizes were still larger between the FMP intervention and control condition for all measures except for concern over mistakes and self-reassurance.

The FMP performed significantly different to the control condition on all measures at one or more timepoints except personal standards which never showed a significant change. For the CCI-P intervention, significant reductions were found at one-month follow-up for all variables except self-reassurance. However, these effects diminished at three-month follow-up for self-hatred, wellbeing, and depression. At three-month follow-up, only one significant difference occurred between the FMP and CCI-P whereby the FMP showed a significantly greater reduction in self-hatred.

Table 6

Completer Analysis Between-Group Effect Sizes With 95% Confidence Intervals, Based On Estimated Means And Standard Errors At End Of Treatment

Variable	End of treatment			One-Month follow-up			Three-month follow-up		
	FMP vs CCI-P	CCI-P vs Control	FMP vs Control	FMP vs CCI-P	CCI-P vs Control	FMP vs Control	FMP vs CCI-P	CCI vs Control	FMP vs Control
Disordered eating	-0.23 (-0.76, 0.30)	-0.51 (-0.96, -0.06)	-0.76 (-1.25, -0.27)	-0.33 (-0.86, 0.20)	-1.03 (-1.50, -0.56)	-1.39 (-1.91, -0.86)	-0.42 (-0.95, 0.11)	-0.75 (-1.21, -0.29)	-1.19 (-1.70, -0.68)
Depression	-0.50 (-1.04, 0.03)	-0.43 (-0.88, 0.02)	-0.96 (-1.46, -0.46)	-0.13 (-0.65, 0.40)	-0.78 (-1.24, -0.32)	-0.92 (-1.42, -0.43)	-0.22 (-0.75, 0.31)	-0.42 (-0.86, 0.03)	-0.66 (-1.14, -0.17)
Anxiety	-0.33 (-0.78, 0.12)	-0.13 (-0.66, 0.40)	-0.47 (-0.95, 0.01)	0.15 (-0.37, 0.68)	-0.76 (-1.22, -0.30)	-0.61 (-1.09, -0.12)	-0.20 (-0.73, 0.32)	-0.48 (-0.93, -0.03)	-0.70 (-1.19, -0.21)
Stress	-0.37 (-0.90, 0.16)	-0.69 (-1.15, -0.24)	-1.08 (-1.59, 0.58)	0.21 (-0.32, 0.73)	-0.78 (-1.23, -0.32)	-0.57 (-1.05, -0.08)	-0.22 (-0.75, 0.31)	-0.55 (-1.00, -0.10)	-0.79 (-1.28, -0.30)
Inadequate Self	-0.20 (-0.07, 0.33)	-0.59 (-1.04, -0.14)	-0.81 (-1.30, 0.32)	0.24 (-0.29, 0.77)	-0.86 (-1.32, -0.40)	-0.62 -1.10, -0.13)	-0.22 (-0.75, 0.31)	-0.59 (-1.04, -0.13)	-0.82 (-1.31, -0.33)
Reassure	-0.16 (-0.68, 0.37)	0.67 (0.22, 1.13)	0.52 (0.04, 1.00)	0.23 (-0.30, 0.76)	0.37 (-0.08, 0.82)	0.61 (0.13, 1.10)	0.13 (-0.40, 0.66)	0.41 (-0.04, 0.85)	0.54 (0.06, 1.03)
Hated Self	-0.13, (-0.66, 0.40)	-0.53 (-0.98, -0.08)	-0.67 (-1.16, -0.19)	0.003 (-0.52, 0.53)	-0.66 (-1.12, -0.21)	-0.67 (-1.16, -0.18)	-0.69 (-1.23, -0.14)	-0.09 (-0.54, 0.35)	-0.79 (-1.28, -0.30)
Concern over mistakes	0.23 (-0.30, 0.76)	-0.70 (-1.16, -0.25)	-0.47 (-0.95, 0.01)	0.37 (-0.16, 0.90)	-0.96 (-1.42, -0.49)	-0.59 (-1.07, -0.10)	0.05 (-0.48, 0.57)	-0.58 (-1.03, -0.13)	-0.55 (-1.03, -0.06)

Personal Standards	0.03 (-0.49, 0.56)	-0.42 (-0.87, 0.03)	-0.40 (-0.88, 0.08)	0.49 (-0.05, 1.02)	-0.70 (-1.16, -0.25)	-0.20 (-0.68, 0.28)	0.15 (-0.38, 0.68)	-0.36 (-0.80, 0.09)	-0.21 (-0.69, 0.27)
Wellbeing	-0.23 (-0.76, 0.30)	-0.51 (-0.96, -0.06)	-0.76 (-1.25, -0.27)	0.12 (-0.41, 0.65)	0.48 (0.03, 0.93)	0.61 (0.12, 1.09)	0.10 (-0.43, 0.62)	0.42 (-0.03, 0.86)	0.54 (0.06, 1.02)

Note: Shaded indicates significantly different from the null hypothesis. Intent to treat: FMP (N = 25), CCI-P (N = 31), Control (N = 53). FMP = Focused Minds Program; CCI-P =Centre for Clinical Interventions Perfectionism modules.

Intervention Credibility

Average credibility scores did not significantly differ between the CCI-P and the FMP group at either mid-point; $t(77) = -0.08$, $p = .94$, or end of treatment; $t(69) = 0.61$, $p = .54$. A significant difference was observed in average expectancy scores whereby scores for the FMP group were significantly higher than the CCI-P group at both mid-point; $t(47) = -7.96$, $p < .001$, and end of treatment; $t(59) = -2.74$, $p = .008$.

User Engagement

Participants accessed the interventions from the 5th September till the 9th October 2022. By the end of the 4-week treatment period, two participants had completed all eight modules in the FMP group (an average of 4 modules) and one participant had completed 7 of the 8 modules in the CCI-P group (an average of 3.6 modules). No participants completed all modules of the CCI-P intervention. Completers assigned to the CCI intervention completed an average of 3.6 modules and completers assigned to the FMP intervention completed an average of 4 modules across the treatment period. Both intervention groups reported completing an average of 75% of the modules they attempted. Rates of study drop-out were significantly lower for the control group than either intervention group. At end of treatment, retention rates were 88% for the control condition, 64% for the FMP intervention, and 67% for the CCI-P intervention. At three-month follow-up, retention was comparable between the FMP (64%) and CCI-P (65%) but decreased to 75% for the control condition.

Discussion

The aim of this RCT was to determine the efficacy of an internet self-guided perfectionism intervention targeting young adults considered at-risk of developing an ED. The rationale for the study was informed by the high association between perfectionism and

disordered eating (Bills et al., 2023; Limburg et al., 2017; Stackpole et al., 2023), and the results of the meta-analysis reported in Chapter Three. The level of disordered eating in this population was considerably higher than the nonclinical average (Tatham et al., 2015). Levels of restriction ($M = 3.27$, $SD = 3.39$) were double that of the reported average in a nonclinical population ($M = 1.59$, $SD = 1.44$). This RCT was novel in its design by comparing two self-guided perfectionism interventions.

In the ITT analysis, both active interventions (FMP and CCI-P) significantly decreased disordered eating over follow-up, with no differences noted between the two. At end of treatment, the FMP intervention outperformed the waitlist control condition by showing a significant reduction in ED symptoms, depression, stress, inadequacy, and perfectionism. This pattern was essentially maintained over follow-up. In the three-month follow-up the FMP managed to maintain significant improvements in six of the ten outcome measures, including perfectionism and ED symptoms. The CCI-P intervention, in contrast, had more significant effects compared to waitlist control at follow-up than at end of treatment, suggesting a delayed effect of the treatment. The CCI-P impacted fewer secondary outcomes than waitlist control, with significant improvements on four outcomes at one-month follow-up and on three at three-month follow-up. Despite showing significant reductions in disordered eating, the CCI-P showed a reduction in only one perfectionism subscale at one-month follow-up and no significant change at three-month follow-up compared to waitlist control.

This finding would suggest that the CCI-P intervention impacted ED symptoms by means other than reducing perfectionism, perhaps through a reduction in self-criticism or negative affect at follow-up. Three possible mediation pathways were identified in post-hoc analyses, yet no significant predictors emerged. Despite this lack of definitive predictors,

inadequacy (self-criticism) approached significance which gives cause for a more robust investigation into mediational pathways in the future. Previous literature suggests self-criticism largely accounts for the relationship between perfectionism and disordered eating symptoms (Dunkley et al., 2006). We note that the FMP group also saw a significant reduction in inadequacy at both end of treatment and one-month follow-up.

In the completers analysis, a greater number of significant differences were found between the control condition and CCI-P intervention at end of treatment. These effect sizes, however, were smaller than those reported for the FMP completer-only results. Whilst CCI-P showed significant improvements on seven outcome measures, more robust effects were found for the FMP intervention on all but two of these measures at end of treatment (concern over mistakes and self-reassurance). Due to the greater number of main effects of group found in the completer analyses versus the ITT analyses, it is likely that engaging in the prescribed interventions leads to greater changes in mental wellbeing. The completers analyses suggest that both interventions have the potential to improve the targeted aspects of mental wellbeing when adhered to.

Adherence and engagement were well-matched between the CCI-P and FMP. Respectively, 27.5% and 28% of participants never accessed a module. The lack of difference between intervention usage confers with previous findings (Linardon et al., 2022) that using an interactive format does not impact intervention uptake or adherence. Study retention was also comparable between the FMP and CCI-P (64% and 65% at 3 month follow up, respectively) whilst retention was considerably higher for the control condition (75% at three-month follow-up). This finding contrasts Linardon et al.'s (2022) results which found that drop-out was lower for an interactive versus static format of the same online intervention. As the two active interventions were not identical, other variations between the programs may

explain why retention rates were not higher for the interactive FMP versus static CCI-P program. The latter finding is typical of waitlisted control groups given they gain access to the intervention after data collection. Attrition rates were comparable with previous investigations of online interventions for perfectionism (Kothari et al., 2019; Shu et al., 2019). The matched ratings of adherence, engagement, and credibility suggests that acceptability of the two interventions is similar.

Strengths

This RCT benefited from using online recruitment via the platform Prolific. The ability to conduct recruitment globally meant a diverse participant sample was obtained, uncommon in the ED literature. Our sample consisted of a high male to female ratio (46% identified as male) collected from over 18 countries. Similarly, over half (52%) of the participant sample identified as non-Caucasian whereas ED literature has a bias towards sampling from Caucasian populations. This use of diverse populations permits some generalisation of our findings beyond the limited Western demographic which ED literature has long had a bias of targeting research and treatment towards.

To truly test the efficacy of the FMP, this newer intervention was compared to an established self-help treatment for perfectionism. The CCI-P self-help modules are evidence-based, use a cognitive behavioural approach, and are similar in length and intensity to the FMP modules. By using the best available alternative, we can understand whether the FMP offers any improvements over current best practice. By addressing a transdiagnostic factor, we show clinical utility across multiple mental health concerns that are impacted by perfectionism. This approach, plus its easy dissemination via the internet, makes it an ideal first point of contact for individuals wishing to improve their mental wellbeing without requiring them first to seek professional help. Individuals at risk for developing an ED may

be more accepting of a transdiagnostic, more generic, approach than having to acknowledge and accept help for disordered eating, resulting in earlier intervention.

Limitations

Whilst the current study was able to draw robust conclusions about the efficacy of the FMP, it still leaves several unanswered questions about what benefits, if any, are unique to the internet interactive format. Whilst there are many proposed features which can enhance the online therapy experience, constraints were placed on the FMP's design due to limited funding and software availability. It is likely that the current version of the FMP did not utilise many digital features that are associated with improved outcome and engagement. A more sophisticated web design is needed to best utilise the components that could lead to higher adherence, lower drop out, and improved treatment outcome. While these findings showed very few significant differences between the two active interventions, the current study may be underpowered to detect modest differences between the two. While results suggest that the FMP intervention contributed to more widespread beneficial outcomes than the CCI-P, the current data provides no clear evidence why this occurred. Expectancy was higher for the FMP than CCI condition, and this may have contributed to this pattern of outcomes. Future trials may consider asking participants for feedback on the aesthetics, comprehensiveness, usability, and real-world applicability of their programs to discern what factors contribute to an intervention's success. The generalisability of these findings may also be limited as we are unable to determine the true nature of participants' motivation to be in the study. It is plausible that the compensation rate of approximately £9GBP/hour influenced participant's decision to partake in this program, rather than a genuine desire to change their perfectionism. Similarly, whilst the eligibility criteria helped to identify and exclude participants who are actively engaged in eating disorder treatment, no screening measure was

applied to diagnose potential participants who would meet an ED diagnosis if appropriately assessed. Whilst this study aimed to address early intervention in young adults who experience sub-clinical levels of disordered eating, the findings of this study cannot be purely related to this population as some potential overlap with clinical cases may have occurred.

Conclusion

In both the ITT and completers analysis the FMP and CCI-P reduced disordered eating and related negative affect, with the FMP showing more consistent improvements. These findings demonstrate how targeting a transdiagnostic risk factor (perfectionism) can impact the treatment of multiple psychological disorders simultaneously. The CCI-P intervention demonstrated that changes in wellbeing can still be achieved without reducing perfectionism, but that such reductions are less pronounced. Whilst previous evidence suggests an interactive format has no impact on symptom outcome, it is possible that the web-based format of the FMP may have influenced the comprehensiveness and implementation of information from this program by increasing interest and immersion with the content (Barak et al., 2009). Other unique features of the website program, such as the inclusion of multimedia content and less volume of text, may have influenced treatment outcome (Barakat et al., 2019). The future use of online perfectionism interventions looks promising given neither of the programs evaluated tapped into the full potential of digital capabilities. The completer analysis showed that increased adherence to the interventions leads to more pronounced improvements in disordered eating, perfectionism, and general mental wellbeing. It is therefore pertinent that issues with attrition and real-world implementation be explored, and that further investigation is done into what moderates the efficacy, uptake, and completion rates for online interventions.

CHAPTER SEVEN: IMPLEMENTATION OF AN ONLINE PERFECTIONISM INTERVENTION IN UNIVERSITY STUDENTS[1]

[1] The study described in this chapter has been accepted for publication since the submission of this thesis and can be found in **Appendix C**. First author contributed 50% to the research design, 50% to data collection and analysis, and 80% to the writing and editing. Second author contributed 20% to the research design, 10% to data collection and analysis, and 2% to the writing and editing. Third author contributed 5% to the research design, 10% to data collection and analysis, and 2% to the writing and editing. Fourth author contributed 5% to the research design, 5% to data collection and analysis, and 2% to the writing and editing. Fifth author contributed 5% to the research design, 5% to data collection and analysis, and 2% to the writing and editing. Sixth author contributed 15% to the research design, 10% to data collection and analysis, and 12% to the writing and editing.

Abstract

Higher Education Institutes (HEIs) have been met with an unprecedented demand on their student counselling and wellbeing services in recent years with the impacts of COVID-19 and high rates of mental health concerns amongst student populations. Online mental health programs offer one solution by providing students with quick and easy access to effective therapeutic content. Dissemination of the Focused Minds Program (FMP), an evidence-based eight-module online self-guided cognitive behavioural intervention targeting perfectionism, is examined in a university population. The program was implemented at a United Kingdom (UK) university between 2021-2023. Recruitment occurred via departmental emails, academic staff, and the university's counselling staff and website. Participants were provided with access to the intervention for six-weeks and completed weekly surveys of psychosocial measures. The trial's implementation was assessed using the RE-AIM framework: reach (uptake via the recruitment channels), effectiveness (outcomes on psychometric measures of mental wellbeing), adoption (staff and organisational support), implementation (intervention engagement and attrition), and maintenance (continued implementation across the trial period). Whilst still proving effective for those who used it, uptake of the intervention was poor. Key barriers to successful implementation, as well as proposed solutions, are discussed to guide future online mental health interventions provided in HEIs.

163

A modified version of the online Focused Minds Program (FMP; www.focusedmindsprogram.com) was offered to students at a Higher Education Institute (HEI) in the United Kingdom (UK) to assess the feasibility of an online low-intensity wellbeing intervention. Efficacy of the FMP has been evaluated previously as part of a three-armed randomised control trial (RCT; Robinson et al., 2023, **Chapter Six**), a program that was informed by numerous previous RCTs showing online cognitive behaviour therapy (CBT) interventions for perfectionism to decrease perfectionism, depression, anxiety, and disordered eating (Galloway et al., 2022; Robinson & Wade, 2021). The FMP has not, however, yet been tested for real-world dissemination and the impact on university students is unknown. Feasibility and effectiveness need to be demonstrated in real-world implementation. To this end this study examines the success of implementation of the FMP for students at a UK HEI.

Implementation outcomes for this trial were assessed according to the Reach, Effectiveness, Adoption, Implementation, and Maintenance (RE-AIM) framework (Glasgow et al., 1999). The RE-AIM framework is an evaluation tool designed to assess the external validity of an intervention through adoption, implementation, and sustainability, in turn providing feedback on program engagement and effectiveness. The RE-AIM model helps to answer the question of who the intervention is most likely to reach, how the program may realistically be implemented, what is the real-world effectiveness, and for what cost (Holtrop et al., 2018). By evaluating its use, the RE-AIM model helps to direct future program usage and to improve on the implementation methods. By using a mixed-methods approach, the RE-AIM framework provides an understanding of the real-world impact of a program beyond its effect on standard outcome measures.

In the current study, implementation was assessed against the five categories of the RE-AIM model. Reach was assessed via the number of referral pathways, uptake via each pathway, and the representativeness of the sample population against the total student population. Effectiveness was assessed using psychological outcome measures from baseline, end of treatment, and one-month follow-up. Adoption was assessed at an organisational level by the number of staff involved in the project, the number of departments that agreed for students to be contacted about recruitment, and qualitative feedback about staff adoption from the UK lead investigator. Implementation and barriers to implementation were examined via rates of attrition and program engagement. Maintenance assessed the sustainability and barriers to sustainability across the trial's duration. Feedback from this pilot project will provide recommendations and adaptations to guide future iterations of the FMP and other digital interventions.

Methods

Setting

The University of Bath (UoB) is a public research university situated in Bath, England. At the time of this study (2021), the UoB had 15,783 domestic students and 4,143 international students. The UoB has 20 departments organised under four faculties: Humanities and Social Sciences, Engineering and Design, Science, and School of Management. The UoB provides students with academic and non-academic support via Student Services which includes wellbeing, disability, financial, international, and counselling services.

Design

This study employed a mixed methods design; however, the majority of qualitative data (student surveys and focus groups) is not presented here due to this information being presented in a third party dissertation. The purpose of the quantitative assessment was to investigate the efficacy and engagement of the FMP during its implementation at the UoB. All data was provided for analysis at the cessation of the study.

Framework

The RE-AIM framework was evaluated using a combination of quantitative and qualitative information. Quantitative information related to the use of psychometric outcome measures and engagement data. Qualitative information was collected via debriefing with the UK lead investigator and a staff member of UoB's student services. Each dimension of the RE-AIM framework was assessed according to the information available.

Student participants

Participation was open to all students aged 17 and over (including part-time, international, and postgraduate students). No eligibility criteria were applied to allow for maximum student uptake of the program and to allow all students who self-identify with any perfectionistic traits to access the intervention. Recruitment was scheduled to commence at the beginning of the academic year (October 2021) and to continue for as long as study recruitment was feasible. No recruitment target was chosen to allow for organic uptake of the intervention to be assessed.

Intervention

The *Focused Minds Program* (FMP) was made available online to students via the virtual learning environment Moodle, which contained introductory material, instructions, and links to all modules. The modules themselves were constructed using online toolkit

Xerte. The FMP was adapted with support from the university's Technology Enhanced

Learning team and was replicated from the original website

([www.focusedmindsprogram.com)](www.focusedmindsprogram.com). The content of FMP is summarised in **Table 1**. Program

content remained faithful to original with changes made to the formatting, interface, and

introductory page for each module. The intervention's length (eight modules designed to take

20 minutes to complete) was kept consistent with the original version. Participants were

provided with videos, interactive and downloadable worksheets, questionnaires, and text. The

FMP was offered as an unguided self-help intervention with technical support on demand.

Table 1

Summary of Module Content from the Focused Minds Program

Module	Module Topic
1	Understanding the expectations of the program, defining perfectionism, exploring the difference between high standards and perfectionism, exploring reasons to change
2	Understanding what keeps perfectionism going, drawing a personal maintenance cycle, introduce unhelpful thinking patterns
3	Conceptualising the cognitive behavioural model, defining unhelpful thinking styles, cognitive restructuring, conducting behavioural experiments
4	Understanding why people are self-critical, identifying the critical voice, identifying the compassionate voice, applying self-compassion through personal values
5	Understanding how perfectionism can encourage procrastination, identifying triggers for procrastination, problem solving procrastination by breaking down large tasks
6	Exploring beliefs which underpin perfectionism, evaluating the truthfulness of these beliefs, conducting behaviour experiments to refute beliefs
7	Creating a self-worth pie-chart, identifying the relationship between self-worth and achievement, consider and expand on areas of life not linked to achievement
8	Recap of all previous sessions, relapse prevention, self-reflection

Measures

Metrics for mental wellbeing included perfectionism, weight and shape concern, disordered eating, depression, anxiety, stress, self-criticism, general mental wellbeing, and intervention credibility.

Two subscales, personal standards (PS; seven items) and concerns over mistakes (CM; nine items), were chosen from the Frost Multidimensional Perfectionism Scale (FMPS; Frost et al., 1990) to measure levels of perfectionism. Cronbach's alpha was 0.84 for CM and 0.78 for PS, indicating good internal consistency.

The Weight Concern Scale (WCS) is a five-item questionnaire measuring weight and shape concerns. Internal consistency (Cronbach's alpha) of the WCS was 0.77.

The Eating Disorder-15 (ED15; Tatham, 2015) is a positively worded 15 item questionnaire that assesses attitudes (ten items) and recent behaviours (five items) relating to disordered eating. Cronbach's alpha of the first ten items was 0.92, indicating strong internal consistency.

The Forms of Self-criticism/Self-reassurance scale (FSCRS; Gilbert et al., 2004) is a 22-item questionnaire which assess negative and self-critical thoughts and feelings. The FSCRS consists of three subscales: self-hatred, self-reassurance, and self-adequacy with Cronbach's alphas of 0.81, 0.85, and 0.85 respectively.

The Warwick-Edinburgh Mental Well-Being Scale (WEMWBS; Tennant et al., 2007) measures a single construct of general mental wellbeing. Cronbach's alpha of the WEMWMBS was 0.91, suggesting strong internal consistency.

The Credibility-Expectancy Questionnaire (CEQ; Devilly & Borkovec, 2000) is a six-item questionnaire assessing intervention expectations and perceived credibility. Cronbach's alpha was 0.73 for the credibility subscale and 0.87 for the expectancy subscale.

The Depression, Anxiety, and Stress Scale- Short Form (DASS-21; Lovibond & Lovibond, 1995) is a 21-item questionnaire assessing depression (Cronbach's alpha = 0.88), anxiety (Cronbach's alpha = 0.84), and stress (Cronbach's alpha = 0.79). See Chapter Three for a full description of the wellbeing measures. See **Chapter Four** for a detailed description of the measures used in this study.

Engagement

Program engagement metrics were captured using a Sharable Content Object Reference Model (SCORM) package embedded within each module link on the Moodle platform. Engagement metrics included number of participant logins, modules accessed during login, and duration of each access. A third-party software engineer assisted with calculating the metrics provided. A series of queries were created and executed using the Python programming language. The queries excluded outliers and invalid records with negative time stamps.

Procedure

Ethics approval was received from the Psychology Research Ethics Committee (PREC) which functions as a sub-committee of the Academic Ethics and Integrity Committee at the University of Bath (Ethics application number 21-211). This study was not prospectively registered. Participation was offered to students within selected departments via departmental emails. Participation was offered first to departments the researchers had direct contact with. Email distribution was contingent upon Head of Department approval in each instance. Other recruitment pathways included personal tutors, student services, and a student services' self-help resources webpage. Staff at student services were able to direct individual students to the program when relevant concerns were evident. All students were asked to indicate how they heard about the program to evaluate effective recruitment routes.

Interested students were directed via their recruitment pathway to a Qualtrics survey. The survey provided students with a participant information sheet and consent form. Consenting participants were asked to provide a contact name and university email address, referral pathway, reason for registering, demographics (i.e., age, gender, ethnicity, department, degree course, year level), and baseline self-report measures. Participants were manually enrolled into the FMP and provided with access for a six-week period. All modules were accessible after first enrolment and participants were recommended to complete two modules per week for four weeks. Participants were asked to complete weekly self-report measures via emailed survey links for the duration of their study enrolment and were also emailed a one-month follow-up survey. All surveys required approximately 10 minutes to complete. All surveys provided a contact email address if participants wished to ask further questions.

Statistical Analysis

Missingness

Due to the significant proportion of missing data, logistic regression was used to determine whether data was missing at random or not. Missingness was categorised using a binary variable with >10% of data missing categorised as *Missing*, <10% data missing categorised as *Complete*. A logistic regression model was then applied to determine whether age, gender, or any baseline outcome measures were predictive of data being categorised as *Missing* or *Complete*. Hosmer and Lemeshow's test determined goodness of model fit.

Intent to Treat Analysis

Intent to treat analysis was conducted using linear mixed models (IBM SPSS Statistics, Version 27) to account for the high proportion of missing data. LMMs were

performed for all outcome measures using restricted maximum likelihood estimations, an unstructured covariance structure, and Bonferroni adjustments. An online effect sizes calculator (https://www.psychometrica.de/effect_size.html#repeated) for repeated measures was used to calculate within-group Cohen's *d* based on estimated means and standard deviations. Pooled standard deviations were used to control for the intercorrelation of both groups (Lakens, 2013). Correlations between pre- and post-test scores were obtained using completers data.

Completer Analysis

The completer analysis was conducted using paired samples *t* tests (IBM SPSS Statistics, Version 27) using only data from participants who completed baseline and end of treatment or follow-up measures. Within-group effect size estimates (Cohen's *d*) were calculated using the standard deviation of the mean difference adjusted by the correlation between measures.

Data Storage

All data stored at the UoB was managed according to the Data Protection Act (https://www.bath.ac.uk/corporate-information/data-protection-act/). A de-identified version of the data was provided by the UoB for quantitative analysis. All de-identified data was password protected and stored on a secure cloud server at Flinders University.

Results

Reach

Participant recruitment occurred over a 15-month period, between November 2021 and February 2023, during which 173 students enrolled in the intervention. Initially the

program was intended to be launched in October 2021 to coincide with the start of the new academic year. However, due to delays in website development and conflicts with the launching of other new year university initiatives, the FMP was launched in November 2021, approximately a month into the academic year. The recruitment pathways were: emails from heads of department or the UK lead researcher (MA) to two of the faculties, staff from student services, in a lecture, other students, academic staff, or from the student services self-help webpage. The recruitment strategy that resulted in the most enrolments was emails sent to students (78% of our total sample). Emails were sent to 7806 students (5029 undergraduate, 2777 postgraduate) and 158 students accessed the baseline survey with 103 enrolling in the study, representing an uptake of 1.32% from students who received an email.

The recruitment strategy that resulted in the second highest number of enrolments was contact with student services. A total of 4,575 students were seen by student services' wellbeing team for a therapeutic session between November 2021 and February 2023. No data is available as to how many students were invited to access the FMP during this time. Of the 173 participants enrolled in the program, 14 (8% of the total sample) reported being referred through student services. This represents an uptake of 0.3% from all students presenting for a service. Of the potentially eligible student population, uptake of the FMP was 0.87%.

According to the University of Bath's Academic Registry, the university population consisted of 19,926 students in December 2021 (See **Table 2** for demographic information). The study sample and university population were well matched for ethnicity and level of study, with oversampling occurring for students aged over 21 years (59% in the study sample compared to 2% in the undergraduate population), females (68.2% in study sample vs 45% in university population) and students from the faculty of humanities and social sciences (67.6%

in study sample vs 33% in university population). Oversampling may be partially explained by targeted recruitment within the faculty of humanities and social sciences which has a majority female population. Perfectionism (concern over mistakes) scores were compared with an Australian university sample of 6,449 students to evaluate representativeness of this study's sample against a comparative demographic (Stallman & Hurst, 2011). Concern over mistakes (CM) scores were significantly higher for the UoB's study sample ($M = 29.03$, $SD = 5.66$) than the average score amongst Australian university students ($M = 19.46$, $SD = 7.35$), $t(6620) = 16.98$, $p < .001$ (scores adjusted for comparison with the briefer version; FMPS-29; Stallman & Hurst, 2011). This indicated that the intervention was reaching students affected by perfectionism. Average weight concern was below the estimated cutoff score of 47 used to predict the development a subsequent eating disorder (Jacobi et al., 2011; Killen et al., 1996). Baseline depression and stress scores were in the moderate range and anxiety was in the mild range (Lovibond & Lovibond, 1995a).

Table 2

Demographic Information for Study Sample and University of Bath Student Population

	Study sample n (%)	Student population (Core student population only)
Age range	17-64 Under 21: 71 (41%) 21 and over: 102 (59%)	Under 21: 13,551 (98%) † 21 and over: 303 (2%) †
Gender	Female: 118 (68.2%) Male: 42 (24.3%) Non-binary: 1 (0.6%)	Female: 9,004 (45%) Male: 10,884 (55%) Non-binary: 38 0.002%
Level of study	Undergraduates: 106 (61%) Postgraduates: 55 (32%) Non-disclosed: 12 (7%)	Undergraduates: 13,854 (70%) Postgraduates: 6,072 (30%)
Ethnicity	White: 105 (61%) BAME: 54 (31%) Non-disclosed: 14 (8%)	White: 13,225 (66%) BAME: 6,317 (32%)
Faculty	Engineering & Design: 29 (17%) Humanities & Social Sciences: 117 (67.6%) School of Management: 5 (3%) Science: 6 (3.5%) Cross Faculty: 2 (1%) Non-disclosed: 12 (7%)	Engineering & Design: 3,806 (19%) Humanities & Social Sciences: 6,670 (33%) School of Management: 3,029 (15%) Science: 6,033 (30%) Cross Faculty: 388 (2%)

Note: †information only available for core undergraduate students. BAME= Black, Asian, and Minority Ethnic

Effectiveness

Intent to Treat Analyses

A main effect of time was found for disordered eating (ED15), perfectionism (both FMPS subscales) and intervention credibility (CEQ-C). See **Table 3** for estimated means and standard errors at end of treatment (EoT) and follow-up. Significant within group effect sizes (Cohen's *d*) were found for every outcome measure at both EoT and follow-up. At EoT, small to moderate effect sizes (*d* =0.2-0.7) were found for personal standards (perfectionism), depression, anxiety, stress, reassurance, self-hatred, general mental wellbeing, and intervention credibility and expectancy. Large effect sizes (≥0.8) at EoT were found for disordered eating, concern over mistakes (perfectionism), inadequacy, and weight concern. At follow-up, small to moderate effect sizes (*d* =0.2-0.7) were found for personal standards (perfectionism) and intervention credibility and expectancy. Large effect sizes (≥0.8) at follow-up were found for disordered eating, concerns over mistakes (perfectionism), depression, anxiety, stress, inadequacy, reassurance, self-hatred, weight concern, and general mental wellbeing.

Table 3

Within Time Effect Sizes Estimated from LMM Output for EOT and Follow-Up (N=22), Including Baseline Observation as a Covariate

Variables	Baseline Covariate	Estimated Mean (SE) at EoT	Estimated Mean (SE) at FU	Cohen's d EoT (95% CI)	Cohen's d FU (95% CI)
ED15	1.60	1.05 (0.14)	1.31 (0.09)	-1.04 (-1.27, -0.81)	-1.77 (-2.02, -1.52)
DASS21 Depression Subscale	4.90	5.18 (0.87)	3.12 (0.54)	-0.40 (-0.63, -0.17)	-1.31 (-1.55, -1.07)
DASS21 Anxiety Subscale	3.72	3.37 (0.59)	2.78 (0.59)	-0.52 (-0.75, -0.30)	-0.95 (-1.19, -0.72)
DASS21 Stress Subscale	8.14	6.40 (0.71)	6.72 (0.66)	-0.71 (-0.95, -0.48)	-1.10 (-1.33, -0.87)
FCRS- Inadequate	23.03	16.19 (1.42)	16.53 (1.65)	-1.13 (-1.37, -0.89)	-2.13 (-2.38, -1.87)
FCRS- Reassure	18.21	19.12 (0.66)	18.85 (0.98)	0.59 (0.37, 0.82)	1.37 (1.14, 1.60)

FCRS- Hated Subscale	4.14	3.00 (0.60)	3.86 (0.89)	-0.47 (-0.70, -0.25)	-1.15 (-1.38, -0.93)
FMPS-CM Subscale	34.20	23.88 (1.01)	24.33 (1.25)	-0.82 (-1.05, -0.58)	-0.94 (-1.18, -0.70)
FMPS-PS Subscale	28.45	24.27 (0.78)	25.50 (0.97)	-0.64 (-0.87, -0.41)	-0.33 (-0.56, -0.11)
CEQ C	6.40	7.17 (0.35)	6.45 (0.46)	0.44 (0.22, 0.67)	0.25 (0.03, 0.48)
CEQ E	4.44	5.17 (0.45)	4.64 (0.63)	0.44 (0.21, 0.66)	0.24 (0.01, 0.46)
WEMBS	43.14	46.16 (1.71)	51.12 (2.48)	0.52 (0.23, 0.75)	2.45 (2.20, 2.71)
WCS	32.18	26.84 (3.02)	23.43 (3.74)	-1.48 (-1.71, -1.24)	-2.55 (-2.81, -2.30)

Completer Analysis

As shown in **Table 4**, a significant reduction in scores between baseline and end of treatment were found for disordered eating (ED15), weight and shape concern (WCS), perfectionism (both FMPS subscales), inadequacy (FSCRS), and treatment credibility (CEQ-C). A significant reduction in scores between baseline and follow-up were found for perfectionism (concern over mistakes) and inadequacy (FSCRS). A significant increase general mental wellbeing (WEMWBS) was found between baseline and follow-up.

Table 4

Completer Analyses, Paired Samples T Tests Corrected for Correlated Observations, for End of Treatment and Follow Up

Variable	Baseline (n=19)		End of Treatment (n=19)		Cohen's d 95% CI	Baseline (n=11)		Follow up one month (n=11)		Cohen's d 95% CI
	M	SE	M	SE		M	SE	M	SE	
ED15	1.37	0.21	0.64	0.18	**-0.91 (-1.44, -0.36)**	1.21	0.39	0.86	0.27	-.59 (-1.25, 0.10)
WCS	36.05	4.96	29.04	4.43	0.13 (-0.44, 0.46)	24.83	6.21	19.67	7.07	-.62 (-1.28, 0.08)
DASS21 Depression	5.26	0.82	5.32	0.96	-0.16 (-0.61, 0.30)	4.20	0.96	2.8	0.70	-.38 (-1.02, 0.27)
DASS21 Anxiety	4.00	0.68	3.53	0.64	**-0.47 (-0.93, -0.15)**	3.20	0.65	2.50	0.73	-.62 (-1.29, 0.07)
DASS21 Stress	8.05	0.79	6.37	0.77	**-0.92 (-1.45, -0.37)**	8.30	1.00	6.80	0.85	-.91 (-1.64, 0.15)
FSCRS Inadequacy	23.32	1.56	16.37	1.54	0.25 (-0.21, 0.70)	22.50	2.93	16.30	2.27	.00 (-0.62, 0.62)
FSCRS Reassure	17.79	1.82	18.84	1.28	-0.26 (-0.71, 0.20)	19.00	1.97	19	1.67	.03 (-0.59, 0.65)

FSCRS Hated	4.16	0.97	3.00	0.62	0.40 (-0.08, 0.86)	4.10	1.79	4.20	1.35	**.83 (0.09, 1.54)**
WEMWBS	42.74	2.22	46.47	1.85	**0.52 (0.04, 1.00)**	43.90	3.04	50.40	3.85	-.21 (-0.83, 0.42)
CEQ Credibility	6.26	0.26	7.15	0.36	0.25 (-0.22, 0.70)	6.67	0.46	6.2	0.81	.20 (-0.43, 0.82)
CEQ Expectancy	4.56	0.55	5.09	0.51	**-1.21 (-0.60, -1.80)**	4.2	0.74	4.63	1.06	**-.81 (-1.48, -0.11)**
FMPS-CM	34.26	1.54	23.68	1.13	**-0.82 (-1.34, -0.29)**	32.55	2.43	24.73	1.87	-.42 (-1.06, 0.24)
FMPS-PS	28.74	0.99	24.84	0.97	**-0.47 (-0.94, -0.01)**	28.00	1.65	24.60	1.89	-.44 (-1.08, 0.23)

Adoption

The program received initial support from the Deputy Director of student services, three staff members from the university's Technology Enhanced Learning team, two project managers from student services, and two members of academic staff from the Department of Psychology. Of the 60 staff members involved with Student Services, approximately 20 had direct contact with students and were actively referring to the program. No issues were reported with staff engagement in promoting the program. Advocacy from the Deputy Director of student services played a significant role in the level of support and promotion the program received. Due to staff turnover, three Deputy Directors were involved during the FMP's trial period. Initial support for the program was strong during the planning stage (2020-2021). However, subsequent support was more conservative after the departure of the first Deputy Director and the program was limited to a proof-of-concept trial by mid-2021 with future implementation being contingent on the program's initial reception. Consequently, only two (Humanities & Social Sciences, and Engineering & Design) of the four faculties were approached via email to participate in the program. Of the 10 departments contacted, seven agreed to their students receiving a recruitment email. Only three departments (Psychology, Education, and Politics and International Studies) agreed to a second round of recruitment emails in December 2021.

Qualitative feedback from the UK lead investigator suggests the loss in FMP support may have resulted from limited communication between organisational leads in student services about the nature and purpose of the program. Information about the FMP was not included in the handover to the current Deputy Director (March 2022-onwards) who was unaware of the program and that perfectionism had previously been identified as a primary concern for students accessing student services. Subsequently, by February 2022 the FMP

was no longer being actively promoted by student services and access was only available via the student services self-help webpage.

Implementation

Intervention delivery was consistent across all participants, given the online nature of the program. However, attrition during the program reduced intervention fidelity and the ability of the intervention to effect change. All participants were provided with access to the FMP for a six-week period. A total of 108 participants accessed the intervention with 37.5% never engaging with the website. Of the total number of enrolled participants, 18 (10.4%) received a full dose of the intervention and completed all eight modules. The highest percentage (21%) of active participants accessed only one module during their enrolment. See **Table 5** for engagement data. Between baseline (n = 173) and end of treatment (n = 19) study attrition reached 89%. Of those that accessed the program, participants completed an average of 3.79 modules and spent a median time of 20 minutes on each module.

At a setting level, the program's launch was delayed due to extended time being needed to investigate and test solutions for displaying content and collection of objective engagement data. Some adaptations were made to the intervention delivery platform due to the lack of resources and availability of appropriate technology, leading to a delay in the program being available to launch. As a result of these technological limitations, no data could be collected regarding what proportion of the intervention's activities were genuinely attempted. Difficulties in program implementation also arose due to the ongoing requirement for staff to monitor sign-ups and enrol students in the program.

Table 5

Engagement Data for Active Users of the FMP

Module	Number of users per module	Number of participants who completed this many modules	Time (minutes) spent on each module (per user)
1	108	23	17
2	85	19	23
3	65	16	22
4	49	16	16
5	35	6	26
6	28	8	24
7	20	2	22
8	19	18	14

Maintenance

Over the course of the trial period, barriers to program maintenance arose between January-November 2022 when the UK lead investigator was unavailable to oversee the project. A members of student services' staff was appointed to manage recruitment and participant data during the interim. Changes in staff roles, other competing program initiatives, and conflicting demands on staff responsibilities caused significant disruption to

the program's promotion and recruitment. As a result, no further recruitment efforts were made, and no data collection occurred after April 2022. The last enrolment to the program occurred in October 2022. Final access to the program occurred in September 2022 despite the program being offered via the student services website until September 2023. Due to lack of handover between staff, enrolments to the FMP were unmanaged after October 2022. Participant engagement with the study (survey completion) declined significantly during the treatment and follow-up period. Between baseline (n = 173), end of treatment (n =19), and follow-up (n = 12) study attrition reached 93%.

During the trial period no data was collected regarding presenting issues for students accessing the services. From October 2022 to September 2023, however, presenting issues were recorded for all service contacts. Perfectionism was a primary concern for 10 students and a comorbid concern for a further 46. Of the total number of presentations to the service, perfectionism was identified as a concern for 1.39% of cases.

Discussion

The UoB's version of the FMP was created in response to the rising demand for student wellbeing services on university campuses across the UK (Thorley, 2017). There is disparity between the need of students and universities to have access to inclusive, effective, and scalable wellbeing interventions and the uptake of these services when they are being offered (Remskar et al., 2022). This trial intended to help reduce the treatment gap by providing students with an easily accessible, low-intensity intervention which addressed a transdiagnostic risk factor for poor mental health and wellbeing. The RE-AIM framework was applied to critically assess the successes and challenges of this trial's implementation, and to guide future iterations of the program.

The scalability of the online program meant reach was initially high via student emails, with the potential for reach to be increased by offering the FMP to more faculties or departments. This potential was not realised, however, due to the limited promotion the program received after the initial launch. This highlights a challenge with reach and the need for continual promotion throughout the academic year, with larger recruitment efforts being focused on the beginning of semesters and around examination periods. Representativeness of the sample population was adequate except for age and gender, where older youths and females were more likely to use the intervention. This finding is congruent with evidence suggesting females and older adults exhibit greater help-seeking behaviours from professional services (Bryant et al., 2022; Mackenzie et al., 2006).

In the intent-to-treat analysis, significant improvements were found for all outcome measures at end of treatment and one-month follow-up. This is consistent with meta-analytic evidence regarding the usefulness of CBT for perfectionism (Galloway et al., 2022; Robinson & Wade, 2021), where medium to large effect size decreases are noted for perfectionism, and medium effect decreases for depression, anxiety, and disordered eating. It is also consistent with hypotheses about the transdiagnostic nature of perfectionism as a risk factor for depression, stress, anxiety, OCD, and eating disorders (Egan et al., 2011). High rates of attrition in the current study likely drove wide confidence intervals and lack of specificity in the effect size estimates, particularly in the completer analysis.

The FMP initially received strong support from researchers, IT, and counselling staff during the program's development. However, difficulties in staffing continuity led to significant disruptions in promotion and support for the program. Organisational leaders were included in the design and planning of the intervention, yet the lack of adequate handover between staff meant that awareness of the program and its relevancy deteriorated with

employee turnover. Advocacy from organisational leaders may improve adoption by other staff members. Similarly, efforts to investigate the barriers to adoption experienced by university stakeholders could have been undertaken via surveys, interviews, or focus groups.

Attrition was a significant limitation and likely impacted on the true efficacy of the intervention due to few participants receiving an 'adequate dosage'. Poor engagement is a major pitfall with e-health interventions and high attrition rates are common in online programs targeted towards youth (Achilles et al., 2020). A limitation of the current study was, despite low engagement across the trial period, no adaptations were made to the study protocol to investigate whether retention rates could be improved. Future iterations of the FMP could benefit from exploring strategies to improve engagement such as offering support on demand, check-in emails, or progress tracking.

The FMP showed excellent potential to be sustainably offered as an adjunct therapy via Student Services. The FMP was successfully integrated into routine use by wellbeing staff during the first half of the trial period and was also accessible via the Student Services wellbeing webpage for the duration of the study. Despite these initial successes, ongoing staff support to was needed maintain promotion, enrolments, and administration for the program. Conflicting staff responsibilities and a lack of clarity for who was responsible for the program contributed to its lack of sustainability. Future iterations of the program may benefit from ensuring program coordination is integrated into the official role responsibilities for a staff position within the university. Several of the duties currently assigned to a member of staff may be better supported with full technical support such as automatic enrolments and chatbot support. The FMP requires sustained support and advocacy from counselling, IT, and academic staff for it to be successfully implemented.

Conclusion

Limited advocacy of the FMP meant that despite initial enthusiasm and backing, implementation of the program was ultimately unsuccessful. Possible improvements for future implementations include greater collaboration with key stakeholders, responsibilities that are linked to roles and not individuals for those involved in the program's administration, and better utilisation of student advocacy for the program's dissemination. Decision-makers and organisational leaders need to be included in the program's development and implementation so that they are aware of what the program is, why it should be advocated for, and assist with making any required changes to the program after its launch. These aims and processes need to be adequately documented to allow for successful handover during periods of staff turnover. Additionally, incorporating the study's administration duties within a staff member's role and setting a clear end date for data collection may help to maintain the program's integrity. Finally, promotion by students and peer mentors, as well as timing the marketing to coincide with critical points in the academic year, may increase the perceived relevancy and visibility of the program. This study shows that achieving effectiveness for an efficacious intervention requires a greater understanding of the factors which can influence reach and uptake of online programs; this forms the basis of the final study.

CHAPTER EIGHT: SCOPING REVIEW OF REACH AND UPTAKE OF ONLINE MENTAL HEALTH INTERVENTIONS

Abstract

Online mental health interventions have the potential to be widely disseminated, easily accessible, and effective. Despite their potential advantages, current practices are sub-optimal in reaching and engaging appropriate audiences who might benefit from self-guided internet interventions. An understanding of strategies to increase the success of recruitment efforts is imperative for the true potential of online interventions to be realised. A scoping review was chosen to investigate current initiatives for improving reach and uptake of online mental health interventions. Four databases (MEDLINE, Scopus, PsycINFO, and CINAHL) were searched for published and unpublished articles (since the year 2000) which have tested or implemented a strategy for improving reach or uptake. Articles which only proposed or theoretically discussed a recruitment strategy were not included. After the removal of duplicates, 1315 articles were reviewed and 16 were included in the final selection. Articles which met the inclusion criteria were data charted and presented using a narrative synthesis. Reach was addressed in eight articles and uptake was addressed in 11 (three articles addressed both paradigms). Strategies included making changes to the recruitment pathways, offering pre-intervention incentives, and refining the enrolment process. This scoping review provides guidance and consideration for how to successfully engage with online populations for future mental health programs.

There is a trending challenge in both clinical research and real-world implementation to engage participants or public audiences in online treatments. These challenges were faced in both the pilot trial (**Chapter Three**) and the UK implementation trial (**Chapter Five**) when trying to recruit and retain participants who were not externally incentivised to participate, despite there being a clear unmet need for perfectionism treatment. Prior research on eating disorder subgroups indicates that attitudes towards e-therapy and online interventions are generally favourable, though given less preference compared with face-to-face therapy (Linardon et al., 2021; Linardon et al., 2020). These findings indicate the challenge may not be due to low acceptability of online treatment in ED populations, but due to broader issues faced by all online interventions; that of attitudinal barriers to uptake and a failure to reach interested parties in a way that relates to them. Many factors have been suggested as barriers to the reach and uptake of online interventions from both a practitioner and consumer viewpoint including stigmatising attitudes, low perceived relevancy, and lack of awareness of available resources (Waller & Gilbody, 2009; Whitton et al., 2021).

What is now needed is an understanding of what measures or strategies can be put into place to help navigate, address, or circumvent these challenges. The question posed in the current study, therefore, is: what can be done to improve reach and uptake of online mental health interventions? To refine the scope of this question, only articles which have assessed a practical means of manipulating reach or uptake are considered in this review. Strategies which are only conceptually proposed, or which relied on a method which did not attempt to manually manipulate rates of reach or uptake, are excluded. Reach is referred to as any contact, communication, or invitation to participate in an online MHI, or broadly as any means by which an individual is made aware of the program and its recruitment opportunities. Additionally, studies had to address uptake and not just adherence, where uptake refers to completing the enrolment, initial screening, or baseline measures, or

accepting an invitation into or clicking on access to an intervention, prior to initiation of the actual program. Anything after the enrolment phase may be argued as participant dropout from an intervention and is beyond the scope of this review.

Due to the unknown breadth and extent of this topic in the current literature, a scoping review was chosen as the appropriate method for mapping what strategies and attempts have been so far made. A detailed analysis of the efficacy of the strategies employed was beyond the scope of this review, but a narrative synthesis was provided of all unpublished and published sources of information. The aim, in part, is to identify gaps in the literature from this information and to allow researchers to consider possible new frontiers in online mental health implementation and recruitment (Arksey & O'Malley, 2005). This scoping review aims to provide guidance and consideration of new or future applications of strategies for improving reach and uptake.

Methods

This scoping review was conducted in line with the five stages outlined in the Arksey and O'Malley (2005) framework. Reporting for this review followed the Preferred Reporting Items for Systematic reviews and Meta-Analyses Extension for Scoping Reviews (PRISMA-ScR) guidelines.

Stage One: Identifying the Research Question

The research question guiding this review was formulated using the SPIDER framework, summarised in **Figure 1** below. The research question was subsequently formulated as "What recruitment efforts or strategies have been attempted to improve reach or uptake of online self-help interventions for psychosocial issues?" A preliminary search of

Google Scholar, Prospero, and Open Science Framework Registries did not identify any

current or prospectively registered literature reviews on the chosen topic.

Figure 1

Research Question for the Scoping Review Provided Using the SPIDER Framework

Sample	Phenomenon of Interest	Design	Evaluation	Research type
•Internet users requiring psychosocial support or therapy	•Ways to increase reach (program awareness) •Ways to increase uptake (program initiation) of online interventions	•Literature search	•Changes to reach or uptake	•Published and unpublished data, qualitative, quantitative, or mixed-methods designs

Stage Two: Identifying Relevant Studies

Eligibility criteria

Relevant articles were required to be written or translated into English; published in

or after the year 2000; to include an internet or web-based (guided or unguided) self-help

intervention for psychosocial issues; and to directly assess, critique, or attempt to improve

uptake or reach of an online intervention. Articles which studied both app-based and web-

based interventions were included.

Articles prior to 2000 were excluded due to the rapid development and significant

change in digital technology that has occurred in the last twenty-four years. Articles were not

considered relevant if they did not assess a strategy for improving uptake or reach, or the

proposed strategy was purely conceptual. Articles which simply detailed the recruitment strategy but did not assess how their recruitment strategy may manipulate recruitment rates, were excluded. Articles were also not included if they assessed telehealth, online group programs, or focused solely on improving uptake and reach in elderly populations. Studies which focused solely on geriatric recruitment were not considered relevant due to the specific barriers to technology use faced by this population.

Information sources

Electronic searches were conducted via MEDLINE, Scopus, PsycINFO, and CINAHL databases. Grey literature was searched using the ProQuest Theses and Dissertations database. Database selection and the initial search strategy were created with the assistance of two specialist research librarians. The initial search string was devised for the MEDLINE database and subsequently adapted for each database:

(dissemin* or reach or promot* or access or communication or recruit* or referr*).tw,kf. OR Communication/ OR (usage or uptake or participate* or accept* or compliance).tw,kf. OR "patient acceptance of health care"/ AND (psycholog* or "mental health" or psychosocial).tw,kf. AND ("self help" or self-help or self-guided or "self guided" or unguided).tw,kf. AND (Digital or online or internet or web or website or webpage or ehealth or emental or virtual or etherapy or technology).tw,kf. OR Internet/ AND (Intervention* or treat* or therap* or program* or initiative* or prevent* or psychotherapy).tw,kf. OR Psychotherapy/ AND limit to yr="2000 -Current"

See **Table 1** for all search terms specific to each database. All electronic searches were conducted within a two-day period (26th-27th October 2023). The citation lists of prominent studies were manually searched to identify additional relevant articles. Where full articles were not available online, first authors were contacted via email.

Table 1

Search Terms Used for Each Database

Medline (Master search)	Scopus	PsycINFO	CINAHL
.tw,kf.	TITLE-ABS -KEY	.ti,ab,id	TI Title OR AB Abstract
MeSH terms	No MeSH	MeSH terms	MeSH terms
Psychotherapy/ Communication/ "patient acceptance of health care"/Internet/		Information dissemination/ Technology Acceptance/ Internet/ (Unexplode all SH)	(MH "Psychotherapy") (MH "Psychology") (MH "Internet") (MH "Diffusion of Innovation")
(psycholog* or "mental health" or psychosocial).tw,kf.	psycholog* or "mental health" or psychosocial	(psycholog* or "mental health" or psychosocial) .ti,ab,id	(MH "Psychology") or psycholog* or "mental health" or psychosocial
(dissemin* or reach or promot* or access or communication or recruit* or referr*).tw,kf. OR Communication/	dissemin* or reach or promot* or access or communication or recruit* or referr*	(dissemin* or reach or promot* or access or communication or recruit* or referr*).ti,ab,id	(MH "Diffusion of Innovation") OR dissemin* or reach or promot* or access or communication or recruit* or referr*
(usage or uptake or participate* or accept* or compliance).tw,kf. OR "patient acceptance of health care"/	usage or uptake or participate* or accept* or compliance	(usage or uptake or participate* or accept* or compliance).ti,ab,id	usage or uptake or participate* or accept* or compliance
("self help" or self-help or self-guided or "self guided" or unguided).tw,kf.	"self help" or self-help or self-guided or "self guided" or unguided	("self help" or self-help or self-guided or "self guided" or unguided).ti,ab,id	"self help" or "self guided" or unguided
(Digital or online or internet or web or website or webpage or ehealth or emental or virtual or etherapy or technology).tw,kf. OR Internet/	Digital or online or internet or web or website or webpage or ehealth or emental or virtual or etherapy or technology	(Digital or online or internet or web or website or webpage or ehealth or emental or virtual or etherapy or technology) .ti,ab,id	(MH "Internet") OR Digital or online or internet or web or website or webpage or ehealth or emental or virtual or etherapy or technology
(Intervention* or treat* or therap* or program* or initiative* or prevent* or psychotherapy).tw,kf. OR Psychotherapy/	Intervention* or treat* or therap* or program* or initiative* or prevent* or psychotherapy	(Intervention* or treat* or therap* or program* or initiative* or prevent* or psychotherapy) .ti,ab,id	(MH "Psychotherapy") OR Intervention* or treat* or therap* or program* or initiative* or prevent* or psychotherapy
limit to yr="2000 -Current"			
Search conducted on 26.10.2023	Search conducted on 26.10.2023	Search conducted on 27.10.2023	Search conducted on 26.10.2023

Stage Three: Study Selection

The first author independently screened all titles and abstracts and reviewed the full texts of all articles considered potentially relevant. The second author reviewed a random sample of 10% of all titles and abstracts and 10% of full texts. All screening was conducted using the online systematic review tool Covidence (https://www.covidence.org/). All double-reviewed full texts were discussed in-person and any discrepancies in article assignment were resolved prior to data charting. Reasons for exclusion during the full text screening were reported.

Stage Four: Data Charting

Data charting was performed by the first author (KR). All data was charted using Microsoft Excel, items included: authors, targeted reach or uptake, study design, type of intervention or therapy, psychosocial issue targeted by intervention, modality of intervention (website or app), methods to improve reach or uptake, measures for change to reach or uptake, results/success of modification to reach or uptake, barriers to reach or uptake being addressed (if specified), participant or population demographics.

Stage Five: Collating, Summarising, and Reporting the Results

Based on the recommendation by Arksey and O'Malley (2007), charted data was synthesised in two ways; numerically to determine the extent and distribution of current literature, and thematically to highlight common patterns and dominant study characteristics. Results were grouped based on whether they addressed reach or uptake. Themes relating to the research question were definitions, strategies implemented, and success rates of those strategies.

Results

Study Selection

Across the four databases, 1315 articles were identified once duplicates were removed. An additional 16 papers were screened via citation list searches which resulted in one additional article in the final selection (Lillevoll et al., 2014). Title and abstract screening removed a further 1187 articles, and 128 studies underwent a full text review. One potentially relevant article (Abdelhalim, 2022) was removed from the final selection as no full text of the study was available. A final selection of 16 articles were included and subsequently data charted. See PRISMA diagram for review of flow and exclusion reasons.

PRISMA Diagram

Flow of Articles at Each Stage of the Screening Process in Covidence
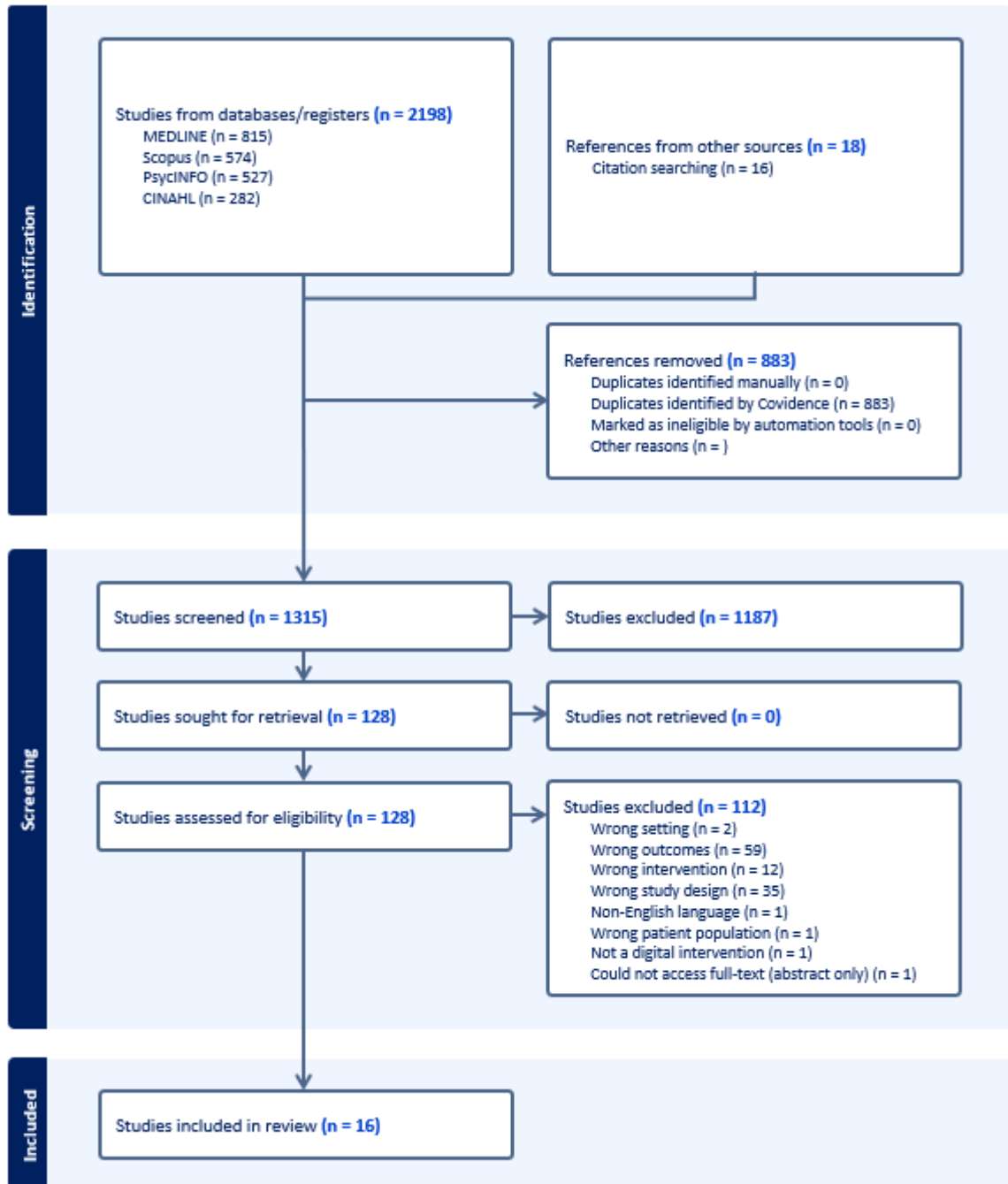
Note: "Wrong study design/wrong intervention" indicates studies that did not manipulate reach or uptake via strategic efforts. "Wrong outcome" indicates studies that did not include reach or uptake as an outcome. "Wrong study design" were either conceptual articles or

literature reviews that did not demonstrate how reach or uptake had been manipulated in a research or real-world setting.

This review included 15 published articles and one unpublished thesis. Most interventions were based on cognitive behavioural therapy (11 studies) and targeted anxiety and/or depressive symptoms (ten studies). Reach (only) was targeted in five studies, uptake (only) was targeted in eight studies, and three studies targeted both reach and uptake. See **Table 2**.

Table 2

Data Charted from All Articles Included in the Scoping Review

First Author, Year and Doi	Targeting Reach (R) or Uptake (U)	Type of Study	Type of Intervention or Therapy	Modality of Intervention (Web, App, etc.)	Methods to Improve Reach	Methods to Improve Uptake	Measures for Change to Reach/Uptake	Outcome (Success) of Strategies for Modifying Reach or Uptake	Barriers to Reach/ Uptake Addressed (If Specified)	Demographic of Participants
Batterham, 2021, 10.2196/23029 Batterham, 2019, 10.1016/ j.cct.2019.01. 015 (protocol paper)	R (males only) U	Three-arm randomised control trial	myCompass2: cognitive behavioural therapy, problem solving, interpersonal psychotherapy, and positive psychology targeting transdiagnostic and specific mental health concerns.	Website	Male Facebook users were targeted using typical masculine-targeted imagery.	Intervention offered with/without engagement facilitation intervention, comprising brief, tailored audio-visual content about efficacy of the program, time commitment, and data security, and testimonials	Intervention website usage rates	U unsuccessful: EFI did not change uptake rates compared with other conditions. R successful: Targeted male advertising successful although slower than general recruitment (with females).	Attitudinal barriers (i.e., preference for face-to-face therapy)	18 years or older, living in Australia, males and females, mild-to-moderate symptoms of depression or anxiety

								about the program.		
Batterham, 2022, 10.2196/34769	R and U	Implementation	FitMindKit: a low-intensity transdiagnostic cognitive behavioural therapy targeting depression and anxiety symptoms	Website	Reach was trialled via three pathways: social media (Facebook and Instagram ads), general practices, and pharmacies. A tablet computer was provided in GP offices and pharmacies for interested participants to complete an eligibility screener.	Uptake rate was compared via three dissemination pathways: GP clinics, social media, and pharmacies	U: the number of participants who enrolled in the intervention. R: the number of people e exposed to information or advertisements for the study within each pathway.	U successful: 1 in every 50 people exposed to the social media advertising took up the intervention compared with 1 in every 441 in GP clinics and 1 in every 1708 in pharmacies. R successful: The web-based dissemination pathway was the most efficient and cost-effective for delivering a self-guided internet-based mental health program to	Poor mental health literacy	Adults aged 18 years or older living in Australian Capital Territory with elevated psychological distress

										people in the community.
Benecke, 2020, 10.1177/2150 13272094332 8	R	Proof of concept	Coping with Corona: Extended Psychosomatic care in Essen "CoPE It": a cognitive behavioural therapy to overcome psychological distress and improve mental health related to COVID-19.	Hotline and website	Multiple recruitment pathways were compared: leaflets, press releases in common newspapers and the local healthcare network.	N/A	Number of visits to intervention website homepage	Potentially successful: The increase in visits to the website homepage could be due to marketing efforts, but causation was not established.	Not specified	Citizens of Essen, Germany (indiscriminate)
Buchner, 2019, 10.1080/1445 9795.2018.15 15974	R	Mixed-methods	German program roughly translated to "Don't gamble away my life- Support for Affected Others": psychoeducation on gambling disorders and coping strategies for individuals	Website	There were 107 promotional activities undertaken in a 10-month period. These included website adverts, newspaper and blog articles, leaflet	N/A	Website traffic data (distinct visitors based on IP addresses)	Successful: visitor rates were impacted by leaflet distribution. No other promotional pathway significantly explained	Not specified	Affected family members (partners, parents, sibling, etc.) of relatives with gambling problems. Age range 18-67 years old

			distressed by their family members' gambling behaviours.		distribution, conference presentations, and handouts at public lectures. Promotional activities were compared against distinct visitor rates to the intervention website.			variance in visitor rates		

Gulliver, 2020, 10.2196/22528	U	Co-design	myCompass: a combination of cognitive behavioural therapy, problem solving, interpersonal psychoterhapy, and positive psychology targeting transdiagnostic and specific mental health concerns.	Website	N/A	Co-design (focus groups and feedback survey) was used to create an engagement facilitation intervention (EFI) which addressed common barriers to engaging with an online intervention	Qualitative feedback from the evaluation survey about common barriers to engaging in online programs	N/A: Not tested in this study	Poor mental health literacy	Community members with depression and/or anxiety aged 18-70 years old

Hentati, 2021, 10.1016/j.invent.2021.100448	U	Randomised control trial	Problem solving intervention including psychoeducation, vignettes, problem-solving exercises	Website	N/A	Intervention engagement was compared using an optimised and basic user interface for the intervention website	Intervention website usage rates	Successful: participants were significantly more likely to uptake intervention if provided optimised user interface	Unappealing user interfaces for online interventions	Swedish general public aged 16 years or older
Lillevoll, 2014, 10.1186/1471-244X-14-14	U	Four-armed randomised control trial	MoodGym: a cognitive behavioural therapy to prevent and reduce depressive symptoms in young people.	Website	N/A	Participants received tailored emails prior to each intervention module with individual feedback on their depression, self-esteem, and anxiety levels (from baseline survey)	Number of participants (in each condition) who commence using MoodGym	Unsuccessful: Uptake did not differ across assigned conditions (when participants received personal feedback about their mental health)	Poor mental health literacy and low perceived relevancy of MHIs	Students of four high schools in Norway, aged between 15 and 20 years old
Llamas, 2023	R and U	Thesis (unpublished)	TenerPoder: a video-based cognitive behavioural	Website (videos)	Various digital and offline recruitment strategies were used to reach	In-person recruitment was tested against social media recruitment. In-	Number of participants recruited (consent	Successful: A greater number of participants were recruited in-person,	Distrust amongst Latinx communities in online and	Spanish speaking Latinx agricultural workers employed in the

			therapy in Spanish.		Latinx farmworkers. Strategies included Google Ads, social media posts, and contacting local farmworker organisations and managers.	person recruitment involved meeting participants face-to-face and potentially assisting them in creating accounts for the TenerPoder website.	obtained) into the study	although the in-person recruitment was more resource intensive and limited by the recruitment efforts of just the principal investigator	telephone recruitment	United States, age range 18-70 years old
Mak, 2023, 10.2196/3850 4	U	Co-design	TourHeart+: a program for mental health promotion, illness prevention, and treatment of common mental disorders	Website	NA	Researchers used a user-centred approach in the development of the website. This involved using a design workshop to test the registration and assessment onboarding process (uptake process).	Survey results from users during usability testing. User feedback provided on each section of the prototype and design.	N/A: Not tested in this study	Difficulties in the uptake/ enrolment process in signing up for an intervention	Adults aged 18-60 years old living in Hong Kong and part of the workforce

Molloy, 2021, 10.3389/fdgth. 2021.653686	U	Mixed-methods	Multiple cognitive behavioural therapy programs	Website	N/A	Treatment rationale and monetary incentives were tested as means to improve uptake related behaviours (clicking links to interventions)	Completing a survey that included a list of iCBT programs and clicking for further information about how to access and download the programs.	Unsuccessful: treatment rationale and financial incentives did not improve uptake.	Attitudinal barriers and low acceptability of online interventions	University and community sample aged 18-85 years old
Muñoz, 2018, 10.21037/mhe alth.2018.05.0 4	R	Review	N/A	Website	Digital apothecaries were presented which allow for access to various evidence-based vetted interventions from a single online source.	N/A	N/A	N/A: Not tested in this study	The current lack of easy access to appropriate, quality evidence-based digital mental health tools	All demographics
Murphy, 2018,	R	Implementation	Headstrong-Taking Things Head On: a collection of	Website	To increase awareness of the initiative and website, a	N/A	Impressions-how many times the ad is viewed in any	Successful: The rate of visits was higher during the	Low help-seeking rates for mental	Men with mental health and addiction problems in

10.2196/12428			online resources for depression, anxiety, insomnia, alcohol use, tobacco use, and suicidal ideation.		Google Ads campaign was developed to attract men living in Nova Scotia who searched for Headstrong website topics and performed general internet searches. Adverts were displayed on PC and mobile devices.		form on the internet. Click-through rate: The percentage of users who view the ad then click on the ad.	Headstrong ad campaign than before or after it. Ads accounted for 63% of site traffic during the ad campaign.	health in male populations	Nova Scotia, Canada
Shroff, 2023, 10.2196/43062	R	Implementation	Project Yes: Single session interventions (English and Spanish) targeting self-kindness, personality traits, pleasure and accomplishment.	Website	Collaboration with local community partners who were invited to attend an orientation session for Project YES. Partners were also provided a social media	Students were provided time and the technology (devices or internet) to enrol in and complete the intervention during regular school hours.	Not measured	Potentially successful: The number of participants reached via recruitment efforts and the proportion who enrolled subsequently are not reported. However, total	Language barriers and culturally inappropriate/lack of cultural relevance of interventions	English and Spanish speaking youths (adolescents aged 11-17 years old) in Texas, USA.

					toolkit to assist with advertising through social media. Two in-school recruitment drives were run where Project Yes was presented during school time and students were able to sign up and complete intervention in class.				number of participants in the study was 1,801. Pre-intervention drop-out rate was >15%.	
Vis, 2023, 10.2196/4153 2	U	Stepped-Wedge Cluster Randomized Trial	Cognitive behavioural therapy including psychoeducation, techniques invoking behavioural change, a cognitive	Website and smartphone apps	N/A	Referral and intervention usage rates were compared prior to and after using a intervention tailoring strategies toolkit (ItFits-toolkit). The toolkit is a web-based self-	Number of patients referred to iCBT and who received login credentials	Unsuccessful: uptake was not significantly different when using the implementation toolkit versus implementation as usual	Lack of relevancy of implementatio n toolkits	Individuals who access in-person mental health services

			component, and relapse prevention			guided tool to support local implementers (in mental health services) in developing implementation strategies that are tailored to local needs.				
Whitton, 2021, 10.2196/28369	R and U	Uncontrolled prospective cohort study	myCompass: a combination of cognitive behavioural therapy, problem solving, interpersonal psychotherapy, and positive psychology targeting transdiagnostic and specific mental health concerns.	Website	A screening tool (StepCare) was provided to identify individuals with anxiety and depression in GP clinics throughout Australia.	The StepCare tool was implemented in GP clinics to help identify suitable candidates for online MHIs (mild symptoms), and guiding GPs in which interventions to prescribe	Number of patients screened in GP clinics. Number of patients who used a MHI when prescribed by GP	U successful: Uptake improved (67%) when MHI was prescribed by a GP (compared to literature rates of uptake) R successful: Reach increased for individuals not previously identified as having mild anxiety or depression (detection rate 43.09%).	The suboptimal integration of online MHIs into routine clinical care.	Adult patients attending a GP appointment who experience mild to moderate symptoms of depression and anxiety

Note: N/A- not applicable. iCBT- internet cognitive behavioural therapy

Data Charting

After an initial review of the literature, a reflexive process was undertaken to review the terminology used to define reach and uptake. Particularly, major discrepancies were found amongst the definitions of uptake. Variations in the conceptualisation of uptake likely stem from the differences in enrolment or onboarding processes for accessing online interventions, which impact how uptake could be measured. The authors made the *a priori* decision to reject the definition of uptake as completing one or more module for an online intervention to limit overlap with the concept of adherence. Various definitions for reach and uptake were accepted to allow for a broad scope of articles to be reviewed. Only seven articles provided a direct statement relating to how reach or uptake were defined. Three articles which discussed reach or uptake provided neither a definition nor a means of measuring either one or both concepts (Mak et al., 2023; Muñoz et al., 2018; Shroff et al., 2023). For the remaining articles, a proxy definition was used based on how reach and uptake were measured.

Definitions of Reach

- Three studies defined reach as the number of clicks on a referral weblink or the number of distinct visitors to an intervention's website (Benecke et al., 2020; Buchner et al., 2018; Murphy et al., 2018).

- One study defined reach as the number of potential participants identified via screening during a GP visit (Whitton et al., 2021).

- One study defined reach as the rate of intervention uptake per exposure to advertising (Batterham et al., 2022).

Definitions of Uptake

- Six studies defined uptake as the initiation of the intervention program i.e., accessing the program at least once (Batterham et al., 2021; Batterham et al., 2019; Gulliver et al., 2020; Hentati et al., 2021; Lillevoll et al., 2014; Shroff et al., 2023).

- Two studies defined uptake as obtaining consent to participate or completing the pre-intervention enrolment process (Batterham et al., 2022; Llamas, 2022).

- Two studies defined uptake as referral rates versus the number of referred participants who used the intervention in the follow-up period (Vis et al., 2023; Whitton et al., 2021).

- One study defined uptake as participants clicking an email link which provided information for accessing multiple iCBT programs (Molloy et al., 2021).

Improving Reach

Reach was assessed in eight studies. Targeted reach (addressing a select demographic) was tested in three studies:

- Male participants were selectively targeted via Facebook. Imagery in the adverts was selected to appeal to male platform users (Batterham et al., 2021).

- Spanish speaking youths were targeted by translating single session interventions into Spanish, by partnering with local community youth organisations, and by running two in-school recruitment drives in public high schools (Shroff et al., 2023).

- A Google Ads campaign was developed to attract males who searched for mental health related topics (Murphy et al., 2018).

Broad reach (addressing an indiscriminate demographic, other than symptom severity) was tested in five studies:

- Recruitment rates for adults with elevated psychological distress was compared across social media (Facebook and Instagram), general practices, and pharmacies. A tablet computer was provided in GP offices and pharmacies for interested participants to complete an eligibility screener (Batterham et al., 2022).

- Digital apothecaries have been created which allow for single pathway access to a collection of vetted online MHIs (Muñoz et al., 2018).

- Citizens of a metropolitan area were contacted via phone calls, leaflets, newspapers articles, and the local healthcare network to offer online and telephone support during the COVID-19 pandemic (Benecke et al., 2020).

- General practitioners provided access to a screening tool (StepCare) in their clinics to identify eligible individuals who experienced symptoms of depression and anxiety (Whitton et al., 2021).

- Affected family members of individuals with disordered gambling were recruited via website adverts, newspaper and blog articles, leaflet distribution, conference presentations, and handouts at public lectures (Buchner et al., 2018).

Improving Uptake

Uptake was assessed in 11 studies. Of these, four articles made changes to uptake via the recruitment process.

- Uptake was facilitated by providing students with time and the technology (devices or internet) to enrol in and complete a single session intervention during regular school hours (Shroff et al., 2023).

- Uptake rates (number of participants who enrolled in the intervention) were compared across three community-based dissemination pathways: GP clinics, pharmacies, and social media adverts (Batterham et al., 2022).

- General practitioners used a screening tool which provided recommendations about which digital MHIs to offer patients based on symptom severity. GPs were then able to recommend vetted digital interventions during regular consults (Whitton et al., 2021).

- Due to difficulties with recruitment via social media and Google Ads, in-person recruitment efforts were tested in a community of Latinx farmworkers. In-person recruitment involved meeting participants face-to-face and potentially assisting them in creating accounts for the intervention website (Llamas, 2022).

Seven articles attempted to improve uptake by means other than changing the recruitment process.

- A co-design process (focus groups and evaluation surveys) was used to inform the development of an engagement facilitation intervention (EFI). EFIs are designed to increase both uptake (initiation) and adherence (use) of online MHIs by addressing engagement barriers identified by end-users (Gulliver et al., 2020).

- Access to an intervention was offered with or without an engagement facilitation intervention (EFI). The EFI comprised brief (5 minutes) tailored audio-visual content containing information that targeted potential barriers to program engagement (Batterham et al., 2021; Batterham et al., 2019).

- A prototype of the intervention was tested to gain end-user feedback on the intervention's registration and pre-assessment processes. Feedback was gained from

end-user interviews and two usability testing sessions. Adjustments were made to the prototype based on the feedback to ensure the uptake process was user-friendly (Mak et al., 2023).

- The effect of providing or not providing a treatment rationale and monetary incentives ($25 raffle) were tested as means to improve uptake related behaviours i.e., clicking on a link to access various iCBT programs (Molloy et al., 2021).

- Uptake (using the intervention at least once) was compared between participants offered a basic or optimised user interface. The basic user interface had less automation and elementary user features whereas the optimised version presented information in a stepwise fashion with enhanced visual graphics (Hentati et al., 2021).

- An implementation toolkit was created to assist local mental health services in using evidence-based strategies to implement iCBT into part of routine care. The toolkit was designed to help healthcare providers tailor implementation based on local needs to improve iCBT uptake rates (Vis et al., 2023).

- High school students (who opted into the study) received tailored, generic, or no emails prior to receiving intervention access. Tailored emails included feedback on depressive symptoms from pre-intervention measures to improve personal relevancy of the program.

Which Strategies Proved Successful at Changing Reach or Uptake?

Although not a major consideration of this review, success rates were explored to determine which strategies have preliminary evidence for their efficacy. Five studies were able to successfully improve reach by using social media, male targeted advertising, GP clinics, and leaflet distribution. Local networking with Latinx community farmworkers was

215

the only reported unsuccessful reach strategy. Three studies successfully improved rates of uptake by using an optimised digital user interface, conducting in-person recruitment with minoritized communities, and by having GPs recommend evidence-based programs to their patients (Hentati et al., 2021; Llamas, 2022; Whitton et al., 2021). Four did not find evidence to support use of their uptake strategies (Batterham et al., 2021; Lillevoll et al., 2014; Molloy et al., 2021; Vis et al., 2023). Two studies that were considered potentially successful required further information to draw a definitive conclusion (Benecke et al., 2020; Shroff et al., 2023). The remainder did not test the efficacy of the strategies described (Batterham et al., 2019; Gulliver et al., 2020; Mak et al., 2023; Muñoz et al., 2018).

Discussion

This scoping review endeavoured to map the available literature pertaining to methods used to increase the reach or uptake of online mental health interventions (MHIs). Factors influencing online engagement and program adherence have been relatively well investigated (Beatty & Binnion, 2016; Fleming et al., 2018; Melville et al., 2010; Yardley et al., 2016), yet factors influencing the reach and uptake of online interventions have comparatively received little attention despite being equally important in ensuring successful implementation into research and real-world use. It is imperative to understand what is known about, what has been tested, and what has been shown to have potential, when looking to improve reach and uptake of online MHIs. The internet is a common first-point of contact for symptomatic individuals who are looking for eating disorder (ED) treatment (Linardon et al., 2020). Despite favourable attitudes and perceived advantages of digital interventions identified in ED populations (Linardon et al., 2021), help-seeking and rates of uptake of online treatments is low in this demographic (Fitzsimmons-Craft et al., 2019; Hart et al., 2011; Nicula et al., 2022). Online interventions have the potential to overcome many barriers to treatment, but current practices are not necessarily optimal in reaching those who are most

in need of, most likely to benefit from, or most appropriate for such interventions. The information gathered from general mental health initiatives may help guide future recruitment efforts in online populations such that treatment effectiveness can be optimised for digital programs.

Ways to Improve Reach

Eight articles were identified in this review which addressed the topic of improving intervention reach. Five articles assessed promotional pathways which investigated how various marketing channels impacted on website or intervention visitor rates. This included digital pathways such as social media (Batterham et al., 2021; Batterham et al., 2022) and online advertising (Buchner et al., 2018; Llamas, 2022; Murphy et al., 2018) as well as print media such as leaflets, newspaper adverts, and physical adverts within general practices and pharmacies (Batterham et al., 2022; Benecke et al., 2020; Buchner et al., 2018). Programs were also promoted by partnering with GP clinics (Whitton et al., 2021), high schools, and community organisations (Buchner et al., 2018; Llamas, 2022; Shroff et al., 2023). Reporting on the success of promotional pathways varied substantially between studies, from specific recruitment percentages per pathway (Batterham et al., 2022; Llamas, 2022; Murphy et al., 2018) to a brief description of recruitment rates improving during marketing campaigns (Benecke et al., 2020). All strategies that were assessed improved reach, though few determined whether the increase was statistically significant (Batterham et al., 2021; Buchner et al., 2018; Murphy et al., 2018; Whitton et al., 2021).

One method which uses no promotional pathways is the creation of digital apothecaries (Muñoz et al., 2018). Digital apothecaries, which function as depositories for online MHIs, involve no active marketing or recruitment processes and rely almost entirely on automated systems to recommend interventions to end-users. The use of digital

apothecaries was one of the few methods for improving reach, which was passive, low

resource intensive, and potentially sustainable as a consequence. Digital apothecaries may

help both health care providers and end-users to identify high-quality interventions without

programs needing to be individually advertised. Muñoz et al. identified the use of digital

apothecaries already in the UK, USA, and Australia, though their use and suggested benefits

are still in their infancy.

Ways to Improve Uptake

Eleven articles identified in this review addressed the topic of improving intervention

uptake. Four articles attempted to improve uptake by tailoring the relevancy of the

intervention to its end-users. One article tailored their intervention's content, one article used

a tailored implementation toolkit, one article provided tailored symptom feedback, and one

article used a recruitment process which tailored who the intervention was offered to. Shroff

et al. (2023) tailored intervention content to Spanish speakers through language and cultural

adaptation with native Spanish speakers presenting content and example vignettes. Vis et al.

(2023) created an implementation tailoring toolkit (ItFits toolkit) aimed at providing mental

health services with implementation strategies that can be tailored to the needs of the local

area, thereby increasing the number of referrals and uptake of an iCBT program. Lillevoll et

al. (2014) provided individual symptom feedback for depression and anxiety prior to granting

module access for high school students who enrolled in an iCBT program (MoodGym).

Whitton et al. (2021) tailored their recruitment process such that online MHIs were offered

by GPs to patients in their clinics who had screened for symptoms of depression and anxiety.

Tailoring the provision of online interventions based on the consumer's symptom severity

and demographic information was suggested, though not tested, elsewhere in this scoping

review (Llamas, 2022; Muñoz et al., 2018). Intervention tailoring is suggested to improve the

perceived relevancy of programs, to overcome the barrier of poor mental health literacy, and aid consumers in deciding which interventions may be appropriate for them (Muñoz et al., 2018). Providing program recommendations via substantiated channels, such as GPs, mental health services, and digital apothecaries, may improve consumer's confidence in the intervention's efficacy and relevancy in comparison to generic online advertisements.

Another strategy to increase uptake was to offer a pre-intervention incentive. This incentive was intended to improve the likelihood of participants beginning an intervention after initial enrolment. Three articles discussed the use of a brief engagement facilitation intervention (EFI) which addressed common barriers to engagement which were identified by lived experience users (Batterham et al., 2021; Batterham et al., 2019; Gulliver et al., 2020). Commonly mentioned barriers included the perception that online programs are insufficiently tailored (lack relevancy), are ineffective, and are difficult to maintain engagement with. These were addressed in the EFI by providing information regarding the intervention's efficacy and content, personalised symptom feedback, and testimonials normalising the use of online MHIs. One study investigated the use of treatment rationale or financial compensation to incentivise participants to use various iCBT options (Molloy et al., 2021). Neither of these methods were effective in improving uptake rates despite qualitative feedback in Gulliver et al. (2020) indicating that an EFI would have a modest effect on intervention uptake.

Two articles involved stakeholders during the development phase to identify barriers to using a web-based platform and to refine the end-users' experience with the website interface (Hentati et al., 2021; Mak et al., 2023). Optimising the user interface was successful in increasing intervention uptake when compared with providing users a basic static version of the same program (Hentati et al., 2021). Since online interventions have the added benefits

of being automated, dynamic, and interactive compared to traditional paper interventions, it is important that user feedback is incorporated into the design. Barriers to uptake may be appropriately addressed by using a co-design process to understand user preferences and modify enrolment process prior to offering online MHIs to wider audiences.

Finally, recruitment pathways were also investigated in two articles to compare rates of uptake via different channels (Batterham et al., 2022; Llamas, 2022). In Batterham et al. (2022) participants recruited via social media were significantly more likely to enrol in an intervention than those recruited via GP clinics and pharmacies. Offering participants treatment in same modality as recruitment may facilitate uptake by lowering the behavioural barrier between enrolment and program initiation. The only recruitment strategy which reported having no impact on uptake was the use of local networking to recruit Latinx farmworkers via organisations and individuals who are tied to the community (Llamas, 2022). Online recruitment efforts were also relatively unsuccessful (recruiting fewer than in-person efforts) in this population, which contrasts the findings of other studies in this review which demonstrated online recruitment to be wide-reaching and prolific (Batterham et al., 2021; Batterham et al., 2022; Buchner et al., 2018; Murphy et al., 2018). A culturally specific barrier was identified by Llamas (2022) such that Hispanic participants reported high levels of distrust in recruitment both via the internet and without knowing the principal investigator. These findings highlight the importance of pre-testing recruitment methods and building connections, particularly in minority groups to mitigate the fears of potential end-users when offering program participation.

Strengths and Limitations

This scoping review was used to determine the breadth and type of strategies used to increase reach and uptake of online interventions. By using a consistent methodological

approach this study was able to compare across a broad range of evidence the strategies, concepts, and definitions related to reach and uptake. Using a scoping review approach meant it was possible to identify a variety of research strategies and implementation attempts, irrespective of the quality of the evidence that accompanies these innovative ideas. In turn, mapping the evidence helped to identify gaps in the knowledge and current strategies used to disseminate and promote online mental health programs. Conversely, since scoping reviews do not synthesise or appraise the quality of the evidence gathered, it is not possible to conclude which methods are best for increasing reach or uptake. Other factors such as time frames, resource availability, cost effectiveness, and intended use of the interventions need to be considered when choosing appropriate promotion and recruitment methods.

This review was also faced with the challenge of choosing and imposing limitations on what constitutes reach and uptake. Despite many including reach or uptake in their aim, only half the articles defined these terms, and all definitions were provided in the context of how the concept was measured or approached in their research. There is a need for a clear understanding of how reach and uptake are defined so that recruitment rates can be easily compared across studies. The definitions for uptake were especially heterogenous and various articles were removed from this review due to their broad scope and overlap with the concept of adherence. The lack of clear parameters for these concepts means that the included terminology of articles was at the reviewers' discretion and may have resulted in a different selection of articles if broader or narrower definitions had been used.

Lastly, the true potential for online interventions comes from worldwide, online dissemination yet none of the included studies attempted mass online campaigning or recruitment. Small demographic or geographic pools were targeted in ten articles (Batterham et al., 2021; Batterham et al., 2022; Benecke et al., 2020; Buchner et al., 2018; Lillevoll et al.,

2014; Llamas, 2022; Mak et al., 2023; Murphy et al., 2018; Shroff et al., 2023; Whitton et al., 2021). Although considered theoretically, none targeted reach or uptake on an international scale, which diminishes the real advantage of online MHIs. Further research is needed into how reach and uptake can be improved broadly to cover larger demographic or geographic areas using online resources.

Conclusion

This scoping review provides a starting point for improving unsuccessful or partially successful recruitment efforts; however, further investigation is needed to answer the question of how to best optimise reach and uptake in various demographics. All the aforementioned strategies are applicable to the field of eating disorder treatment and may spark further research into what can be done to increase sub-optimal rates of engagement in this population. It is likely that all the reviewed methods, and more, need be investigated in the context of eating disorder interventions before online treatment programs can be considered effective in this context.

CHAPTER NINE: DISCUSSION[1]

[1] This chapter contains content from two published papers that are provided in **Appendices.** The first study described in this chapter is detailed below and can be found in **Appendix A**. First author contributed 20% to the research design, 80% to data collection and analysis, and 80% to the writing and editing. Second author contributed 80% to the research design, 20% to data collection and analysis, and 20% to the writing and editing.

Robinson, K., & Wade, T. D. (2021). Perfectionism interventions targeting disordered eating: A systematic review and meta-analysis. *International Journal of Eating Disorders, 54*(4), 473-487. https://doi.org/https://doi.org/10.1002/eat.23483

The second study described in this chapter is detailed below and can be found in **Appendix B**. First author contributed 70% to the research design, 80% to data collection and analysis, and 80% to the writing and editing. Second author contributed 5% to the research design, 5% to data collection and analysis, and 5% to the writing and editing. Third author contributed 5% to the research design, 5% to data collection and analysis, and 5% to the writing and editing. Fourth author contributed 10% to the research design, 10% to data collection and analysis, and 10% to the writing and editing.

Robinson, K., Egan, S. J., Shafran, R., & Wade, T. D. (2024). A randomised controlled evaluation of an online perfectionism intervention for people with disordered eating – how perfect does it need to be? *Cognitive Behaviour Therapy*, 1-16. https://doi.org/10.1080/16506073.2024.2313739

Overarching Aims

This thesis aimed to evaluate the feasibility, efficacy, and implementation of an online intervention for perfectionism to improve disordered eating in young adults who have elevated risk of developing an eating disorder. Perfectionism was targeted using an eight-module internet intervention with each module addressing a core factor of perfectionism (i.e., self-worth, procrastination, self-criticism). Targeted populations included people with disordered eating, global online recruits aged 17-25 years old (**Chapters Five** and **Six**), and university students (**Chapters Five** and **Seven**). Feasibility (including acceptability and adherence) was addressed in **Chapter Five** with a pilot trial which provided qualitative feedback and engagement data from undergraduate university students. Efficacy of the intervention for reducing symptoms of perfectionism, disordered eating, depression, anxiety, and self-criticism was addressed in **Chapter Six** through a fully powered randomised control trial (RCT). Finally, a pilot trial of the perfectionism intervention in an uncontrolled university setting allowed for real-world feasibility testing of the program in **Chapter Seven**. An implementation framework was used to address the successes and challenges of the pilot and a follow-up scoping review in **Chapter Eight** provided further considerations for how the feasibility and implementation of online programs may be improved in future trials. The combination of pilot testing, efficacy trial, and real-world implementation allowed for a comprehensive evaluation of the Focused Minds Program as intended.

The results of this work also inform whether perfectionism is suitable for inclusion as part of routine care for eating disorders and whether it warrants to be offered as a stand-alone early intervention. The first study (**Chapter Three**) identified previous perfectionism interventions that have assessed disordered eating or body image as outcomes through a systematic search and meta-analysis. Whilst a handful of studies evaluating perfectionism

interventions address body image concerns or disordered eating (Robinson & Wade, 2021), only one other study identified in the literature specifically targeted a population who were characterised by high levels of ED symptomatology (Steele & Wade, 2008).

This thesis differentiates itself from previous perfectionism intervention trials by being the first to target at-risk individuals with elevated weight and shape concerns, rather than selecting participants based on their elevated perfectionism or clinically recognised ED. By focusing on indicative prevention in **Chapters Five** and **Six**, this thesis aimed to determine whether a perfectionism intervention is acceptable and efficacious when routinely offered to individuals considered at-risk of developing an ED irrespective of their baseline perfectionism. The efficacy of targeting perfectionism and the feasibility of offering a perfectionism intervention as a stand-alone treatment are summarised in the findings below.

Main Findings

The main findings have been presented under five categories or themes which seek to provide the reader with the "take home messages" from this thesis. The main findings have been extrapolated from across all studies and presented based on how they relate to the overarching aim of the thesis.

Finding One: Online Perfectionism Interventions are Acceptable

Acceptability relates to an end user's willingness to engage with a mental health intervention (Park et al., 2022). Determinants of acceptability included user feedback and adherence to the program. The pilot trial, presented in **Chapter Five**, gathered qualitative feedback and usage data to understand the acceptability of a perfectionism intervention and identify potential barriers which caused disengagement. Feedback on the Focused Minds Program (FMP) indicated the intervention was acceptable amongst the sample of students

included in the trial. Participant feedback included only minor modifications to program layout and content, including reducing the volume of text, providing clearer instructions for self-guided activities, providing ample opportunities for self-reflection, and allowing content to be downloadable. Significant barriers were the time commitment involved in completing sessions and a desire to avoid tackling perfectionism as an issue. Engagement data, collected in the RCT (**Chapter Six**) and uncontrolled pilot trial (**Chapter Seven**), indicated participants were willing to engage with the FMP to a degree, but not to the extent as to receive a full treatment dosage (i.e., all eight modules). Amongst active users, both studies saw an average completion rate of half the number modules in the program, with 10-20 minutes spent per module. Completion rates were similar to those found in previous perfectionism intervention studies (Shu et al., 2019; Wade et al., 2019) suggesting 3-4 sessions may be the peak acceptable dosage amongst unguided CBT for perfectionism. Completion of all modules by participants was minimal across both the RCT (3%) and the implementation trial (11%). These completion rates, coupled with the feedback that the modules should be shorter, suggests that acceptability of the FMP may be improved by offering a condensed version of four modules of approximately 1-hour total contact time.

These findings regarding the FMP's acceptability benefited from the inclusion of a diverse population in terms of gender and ethnicity. Unlike the initial pilot trial, which relied on an entirely female and predominantly Caucasian population, the latter trials were able to test the acceptability of a perfectionism intervention using populations which included substantial proportions of male and non-western participants. In particular, the RCT was able to assess program usage outside of a westernised higher education institute which is a common setting for research trials. Whilst website metrics make for crude measures of program acceptability, the willingness of participants to engage with the FMP gives some evidence in support of its use as an acceptable intervention amongst diverse populations.

Finding Two: Perfectionism Interventions are Efficacious for Decreasing Disordered Eating

At the commencement of this thesis there was enough preliminary evidence available regarding the impact of perfectionism interventions on disordered eating and body image concerns to warrant a review. The systematic review (SR) and meta-analysis (MA), presented in **Chapter Three**, synthesised the evidence to provide an estimate of the impact of perfectionism interventions on reducing eating disorder (ED) symptoms. Two prior meta-analyses investigated the transdiagnostic effect of treatment for perfectionism. Suh et al. (2019) conducted a MA incorporating 10 studies which utilised face-to-face and online interventions to target perfectionism. Their analyses were conducted using only randomised control trials (RCTs) with control conditions including wait-listed or active controls. Their analyses provided an estimate of the efficacy of using cognitive behavioural therapy (CBT) to reduce perfectionism. The results indicated perfectionistic strivings and perfectionistic concerns are both responsive to psychotherapy and are potentially viable targets for improving related psychopathologies. These findings were congruent with an earlier MA performed by Lloyd et al. (2015) whose eight included studies noted a moderate within-time reduction for anxiety and depression when targeting perfectionism. Their review demonstrated a reduction in perfectionism was associated with a small reduction in objectively reported binge-purge episodes, a moderate reduction in vomiting, and a large reduction in shape and weight concerns. These conclusions were, however, based on a single study (Steele & Wade, 2008) and no significant main effect of group was observed at end of treatment. Further investigation was required to determine whether targeting perfectionism may be a viable means of reducing ED severity.

The SR and MA sought to update the findings from these earlier reviews and to ascertain to what degree perfectionism interventions are supported as an effective treatment to reduce ED symptoms. In line with the previous literature, depression and anxiety were concurrently investigated and estimates were calculated for both between- and within-group effect sizes to allow for ease of comparison. This MA was the first to compare the impact of perfectionism interventions on depression, anxiety, and ED symptoms using between-group estimates. Nine studies were identified which indicated that perfectionism interventions had a large effect on the reduction of perfectionism and ED symptoms (between-group and within-group analyses), and a moderate effect on the reduction of anxiety and depression (within-group analyses only). Between-group analyses did not demonstrate a reduction in depression and anxiety, although this is likely accounted for by the exclusion of studies which addressed only depression and anxiety which may have produced more robust effect size estimates.

One explanation for why perfectionism interventions have a greater impact on disordered eating than on depression and anxiety is that perfectionism likely does not contribute equally to the development and maintenance of various psychopathologies. This notion is supported by Limburg et al. (2017) who demonstrated using path analysis that perfectionistic concerns and perfectionistic strivings are not equally correlated with depression, anxiety, and EDs. Both dimensions of perfectionism uniquely explain ED symptoms, however, perfectionistic strivings contribute minimally to depression and anxiety, and correlates to a greater extent with anorexia nervosa and bulimia nervosa. As perfectionism interventions reduce both dimensions of perfectionism (Suh et al., 2019), ED symptoms may reduce to a greater extent because a greater portion of the contributing factors are being targeted. Alternatively, perfectionism may impact a wider and more diverse range of components in disordered eating than in depression or anxiety. Perfectionism may contribute to and maintain disordered eating more globally through perfectionistic standards

229

being applied to multiple areas such as diet, exercise, and appearance (Smith et al., 2007; Watson et al., 2011).

Since this SR and MA were conducted and published, more recent literature reviews have robustly demonstrated that perfectionism is susceptible to treatment with CBT being the leading treatment type (Galloway et al., 2022; Shafran et al., 2023). To date, at least 15 randomised control trials (RCTs) of CBT for perfectionism have been conducted across a range of ages, modalities, and outcomes. A further 10 studies have investigated the use of perfectionism using non-CBT approaches such as mindfulness and compassion focused therapy, indicating the use of perfectionism interventions is expanding. Ongoing critique for the use of perfectionism interventions include the lack of dismantling approaches identifying specific processes which lead to a reduction in symptoms, and the lack of mediational analyses or predictors of outcome (Shafran et al., 2023; Smith et al., 2022).

The RCT in **Chapter Six** built on the existing body of literature supporting the use of perfectionism interventions by comparing the efficacy of two self-guided online perfectionism interventions. The investigation was also used to determine whether an interactive (FMP) versus static (CCI-P) online format offers any benefits to adherence, drop out, or treatment outcome. Both the interactive and static versions were efficacious for reducing disordered eating, whereas the interactive program reduced a greater number of secondary symptoms including depression, stress, and self-inadequacy. It is plausible that the mode of delivery, interactivity, or shorter content of the FMP made the intervention easier for participants to comprehend or implement which could explain the more diffuse symptom reduction seen in the FMP but not the CCI-P (Barakat et al., 2019). Further investigation using a dismantling approach would be needed to verify this possibility.

Both interventions maintained some benefits at one and three-month follow-up, indicating effective engagement occurred with the programs' content to produce desired change. Rates of attrition and program completion were the same between both active conditions, suggesting that the interactive format had little impact on engagement. A significant feature of this RCT was that two different perfectionism interventions were compared, and proved effective, in a majority non-White and largely non-female population. The findings of this RCT add to the evidence base for the use of perfectionism interventions as an efficacious means of indicative treatment for EDs in non-western populations.

To date, few studies have compared online CBT for perfectionism (CBT-P) against an active comparator. Two of the most recent include Shu et al.'s (2019) study which used a stress management intervention for comparison and Rozental et al. (2024) which used a transdiagnostic treatment of emotional dysregulation called the Unified Protocol. Whilst Shu et al. (2019) was underpowered to detect statistical significance, the results were in the expected direction for improving perfectionism, depression, anxiety, self-esteem, and ED symptoms, favouring the perfectionism intervention. Rozental et al. (2024) was able to demonstrate both CBT-P and the Unified Protocol to be effective at reducing perfectionism and stress, and at increasing self-compassion, though ED outcomes were not examined. These results further support the notion that online perfectionism treatment is efficacious at improving wellbeing across multiple psychopathologies. Additionally, these trials indicate that treating perfectionism is a viable option when compared with suitable alternative treatments. The results of these two independent trials, plus the meta-analysis and RCT, provide robust evidence that perfectionism interventions are an efficacious transdiagnostic treatment approach.

Finding Three: Implementation of Online Interventions is Challenging

An efficacious intervention is of little value without adequate adoption, uptake, and engagement. Even programs which have proven to be highly successful in controlled trial settings will fail, or not have the intended outcomes, if unsupported by measures of feasibility (Park et al., 2022; Perski & Short, 2021; Short et al., 2018). Adequate feasibility testing is critical to extend on efficacy trials and to predict real-world effectiveness. Whilst the RCT was able to provide sufficient evidence as to the efficacy of the FMP, real-world implementation conducted online and at the University of Bath (UoB) provided a less definitive outcome as to its effectiveness. Attrition, poor adherence, and lack of uptake are major issues for ED treatment and online interventions generally (Achilles et al., 2020; Batterham et al., 2015; Linardon & Fuller-Tyszkiewicz, 2020; Molloy et al., 2021; Wade & Wilksch, 2018). It is therefore unsurprising that all three were encountered during the FMP's implementation process.

Findings from the pilot trial demonstrated that providing the FMP as an open-access program with no marketing strategy had almost no uptake, very high attrition, and was definitively unsuccessful as a means of providing access to an online self-guided intervention. Offering the FMP to a closed recruitment pool (i.e., undergraduate university cohort; **Chapter Five**) was successful when the program usage was incentivised with course credit, but uptake and usage were poor when offered as a university-wide wellbeing strategy. Three key challenges were identified with the implementation trial at the UoB: a lack of perceived need for a perfectionism intervention amongst students accessing wellbeing support, a lack of ongoing advocacy for the program to maintain visibility to students, and high attrition amongst students enrolled in the program.

Perfectionism was not identified as relevant for many students at the UoB who accessed the student wellbeing services. Only 1.4% of students accessing the wellbeing

services rated perfectionism as a concern, which potentially limited who the program was offered to by wellbeing counsellors. This is likely in part due to a common misunderstanding about perfectionism being often viewed as a normal or desirable trait (Kelly, 2015). Support from academic and organisational leads also fluctuated across the trial period, resulting in inconsistent promotion, and limiting visibility of the program to students unless actively seeking help for perfectionism. These findings highlight the need for improved literacy on the characteristics and effects of perfectionism so that both students and providers can identify when perfectionism is impacting a person's wellbeing and when it may benefit from intervention. One solution may be to offer the FMP in such a way that specific behaviours are identified and linked with negative impacts in marketing, giving students a clearer connection between perfectionism and other psychosocial stressors. Similarly, future marketing strategies may consider promoting perfectionism interventions as aimed at improving wellbeing or use marketing tactics which promote the benefits of tackling perfectionism without first having to convey to the audience the relevancy of perfectionism. By removing the focus of promotion from perfectionism such interventions may seem more approachable to wider audiences where perfectionism is poorly understood.

Additionally, conducting a needs analysis at the UoB would have been useful to ensure such an intervention would meet the existing needs of students and ensure there was a demand for such a service. A needs analysis is the first step proposed in the *Framework for Implementation of Digital Mental Health Interventions* by Park et al. (2022). Community and organisation-specific needs are important to understand early on to improve the chance of sustainable implementation (Park et al., 2022). Conducting a needs analysis could have highlighted stakeholders' perceptions of the FMP and addressed the lack of perceived relevancy ahead of the implementation trial. It may have also provided the chance for feedback on when the intervention should be offered in the academic year and which

233

channels for recruitment were likely to have resources available for continued promotion. Implementation practices will likely benefit from being guided by the needs and available resources of the community where implementation is to take place (Park et al., 2022).

Another limitation which likely impacted the success of the UoB implementation trial was that the implementation process was not iterative, and changes were not made based on emerging trends in how the program was being received initially. The trial had a substantial run time of more than one year; changes during this time could have led to amendments in how the program was being offered and improved sustainability of the program. These challenges suggest this trial underrepresents the potential effectiveness and success of similar online wellbeing interventions which have greater advocacy, promotion, and perceived relevancy amongst the community. This evaluation emphasises the importance of an intervention being adopted at an individual and organisational level to influence the intended audience; weakness in either factor can prevent successful implementation. These results strongly support the notion that online self-guided interventions need ongoing advocacy and sustained recruitment efforts, even when the intervention is being offered in a "hands off" unguided manner.

Both the pilot and implementation trial were unable to demonstrate the success of current implementation practices, however, they provide qualitative and quantitative feedback which could improve the implementation process. Amendments based on findings and feedback could be adapted and tested in a second implementation trial. It is unlikely for successful implementation to occur on the first trial, particularly without comprehensively understanding the needs of the community where it is to be implemented. As such, limited conclusions can be drawn about the effectiveness of FMP based on these two trials, but that is not to say future attempts would not have greater success.

Finding Four: Potential Improvements Can be Made in the Use of Online Mental Health
Interventions

Digital and online mental health interventions (MHIs) have been suggested as the solution to barriers of face-to-face therapy due to their relatively low cost, scalability, and lack of gatekeeping processes. Online interventions have the potential to facilitate access to mental health care, particularly amongst individuals who may be unable or unwilling to access face-to-face supports (Ellis et al., 2013; Pretorius et al., 2019). Internet interventions may also effectively fill the time between referral and treatment beginning for individuals who do seek help (Vollert et al., 2019). Online interventions are shown to have good efficacy for treating a range of mental health issues (Andersson et al., 2013; Sander et al., 2016; Wang et al., 2023; Zhou et al., 2021) when appropriately adhered to (Donkin et al., 2011; Wade et al., 2019). Yet despite these promising characteristics, online MHIs have failed to fill the treatment gap as surmised and current processes do not optimise the available technology to provide accessible mental health care. Findings from this thesis have identified some of the difficulties associated with online MHIs but also inform potential solutions to enhance their use. Findings from the literature review, implementation trial, and scoping review provide context to the challenges faced when offering online treatment.

First, both the implementation pilot trial (**Chapter Seven**) and subsequent scoping review (**Chapter Eight**) highlighted the importance of relevancy when offering a program to participants. In the implementation trial, students accessing university wellbeing services were rarely seeking support for perfectionism despite its association with academic and psychosocial stressors, which led to a loss in advocacy for the program. In the scoping review, relevancy referred to cultural relevancy (culturally appropriate content and language) which was adapted in various studies to improve the uptake of a given intervention in

minoritised groups. This suggests the ability of a program to relate to, and seem relevant to, an individual is critical if that program is to be used. Marketing and recruitment efforts need to account for relevancy and to communicate effectively how and why an intervention might be useful to the end-user. Dissemination of online programs may benefit from improved education and tailored promotion so that individuals understand the personal benefits of a program prior to engaging with it. In relation to the FMP, a greater understanding of, and socialisation to, the meaning and adverse impacts of perfectionism is needed to improve intervention relevancy. Psychoeducation about the differences between perfectionism and high standards, and the central role of self-criticism in producing adverse consequences such as procrastination, could be helpful. Many practitioner barriers also stand in the way of using online treatments due to hesitancies around efficacy, ethics around providing online treatment (ethical responsibility), and concerns about privacy (Peipert et al., 2023). Ensuring awareness, education, and relevancy of online interventions for healthcare providers is equally important, such that appropriate and evidence-based programs can be promoted as a part of routine healthcare.

Second, in both the implementation trial and scoping review it was noted that 'who' was offering the program was almost as important as 'what' was being offered. Whether the program was lent credibility by being offered via a reputable source (i.e., academic tutors, wellbeing staff, doctors) or via peers (i.e. other students, other users of the program, personally knowing the researcher; Hentati et al., 2021; Llamas, 2022; Whitton et al., 2021), uptake rates and participant feedback indicated that how participants were approached about a program impacted their likelihood of initially engaging.

Last, a lack of awareness about the existence of online interventions was highlighted in the scoping review (Gulliver et al., 2020; Whitton et al., 2021) and reiterates the

importance of effectively marketing interventions to appropriate consumers whilst also making clear to the target audience the relevancy of these programs. Access to mental health care via the internet could, in theory, be excellent. However, the reality of online mental health is that interventions are in direct competition with all other online content, vying for the attention of consumers. It takes concerted effort to create an online presence that can compete with the likes of social media and other web content which is detrimental to psychological wellbeing. Highly visible, informative, accessible, and evidence-based treatments are needed online to provide young adults with content which counteracts the online diet and beauty culture. Consequently, the placement of advertising, access links, and ambassador posts should be directed, using consumer driven data, on locations around the internet where ED culture is most prevalent.

Finding Five: Perfectionism as an Effective Approach to Early Intervention

Feasibility is determined by whether there is a need for a mental health service and whether an intervention can meet those needs (Park et al., 2022).The results of the five studies and the literature review conducted in this thesis have indicated that online perfectionism interventions: are efficacious based on prior literature and testing via a randomised controlled trial, are able to target symptoms of psychological distress, and are acceptable to young adults based on completers' user engagement and feedback. Previous literature discussed in this thesis highlighted the unmet need for easily accessible and scalable mental health interventions in young adults and university students (Ali et al., 2020; Phillipou et al., 2023; Thorley, 2017). Prior evidence suggests providing an online intervention targeting perfectionism may circumvent some of the help-seeking barriers commonly associated with ED treatment such as shame, stigma, and depreciating symptom severity (Ali et al., 2017; Radunz et al., 2023). Based on this select evidence, perfectionism interventions

are appropriate for use in early intervention as they meet the needs of consumers and should be available to anyone at-risk of developing an ED. However, feasibility also involves addressing individual and systemic barriers such that an intervention is adopted by users and service providers within usual practice (Park et al., 2022). The results of this thesis indicate the effectiveness of an online perfectionism intervention is limited under current conditions. Substantial support is needed for online interventions to be adopted into routine care and further research is needed to understand best implementation practices. The scoping review from this thesis indicates there is limited literature investigating ways to optimise reach and uptake, which are part of the implementation process. Better implementation practices are needed before online interventions can be routinely and sustainably offered as a means of indicative ED prevention.

Limitations

Limitations are evident within this thesis and within the broader fields of perfectionism and online MHI research. A significant limitation of this thesis and the related research area is the existence of multiple conceptualisations of perfectionism. Numerous definitions, measures, and factor analyses of perfectionism have indicated slightly different core components. A lack of clarity around how many components there are to perfectionism, as well as which are maladaptive versus adaptive, has led to confusion around which components should be routinely targeted and measured (Shafran et al., 2023). Frost et al.'s (1990) factors of *concern over mistakes* and *perfectionistic strivings* were chosen as the most appropriate measures for the included studies due to their established association with ED symptoms (Limburg et al., 2017; Stackpole et al., 2023), and to align with the theoretical proposal of these two dimensions by Stoeber and Otto (2006). The use of only two subscales from a single perfectionism scale likely limited the burden on respondents, but also limited

which aspects of perfectionism were measured and captured. Limiting the number of perfectionism components which were assessed creates a trade-off between having parsimony in the studies' results and being able to capture additional information on how respondents improved in other areas of perfectionism.

Resource limitations were imposed on the perfectionism intervention trialled which likely impacted on the successful dissemination and uptake of the program. A lack of funding limited marketing opportunities in the initial pilot trial (**Chapter Five**) which tested for online global dissemination and in the implementation trial (**Chapter Seven**) which tested for university-wide dissemination. Online interventions may benefit from having a captive audience in controlled settings, such as in a research trial based around a physical clinic, but the true advantage for online interventions comes from geographically unlimited online dissemination. The advantage of digital interventions to reach wide audiences was not achieved, either in a defined population at the University of Bath or when provided openly and with free access in the pilot trial. Utilising marketing tools such as pay-per-click online advertisements and social media campaigns could have significantly impacted the program's reach, but resource costs are inhibitive for non-commercialised products such as the FMP. Similarly, a lack of funding and software expertise limited the digital capabilities of the FMP across all studies. The benefits of digital interventions such as real time monitoring, automated feedback, chatbots, and tailorable content were not realised in the current program. Limitations on funding and resources meant such features were not obtainable, but may have been able to improve adherence, acceptability, and subsequent effectiveness, of the FMP above what was achieved.

Significant non-adherence to cognitive behavioural therapy (CBT) for perfectionism has been well documented previously (Shu et al., 2019; Smith et al., 2022) and the findings

from this thesis were no exception. Full adherence (completing all modules within the suggested timeframe) was achieved by a minority number of participants across the pilot trial, RCT, and implementation trial. Reasons for this lack of adherence could be partially explained by a lack of compensation or incentivisation for modules completed, online engagement fatigue, or some yet unidentified part of perfectionism treatment that is intolerable to users (Smith et al., 2022). Online engagement fatigue is an emerging phenomenon relating to the lack of engagement, enthusiasm, and motivation for online learning due to the increase in online education driven by the COVID-19 pandemic (Maloney et al., 2023). As the FMP was offered to university students during and post-pandemic, it is possible that online engagement fatigue reduced the desirability of an online mental health program following intensive online learning experiences, particularly in the United Kingdom which underwent significant periods of lockdown and campus closures. It is possible that, since the return to a more balanced online and face-to-face learning experience, students may be more willing to engage with online treatment options. The poor adherence rates found within these trials of the FMP could also reflect a larger phenomenon in psychotherapy in that a significant proportion of individuals accessing mental health services will engage in just one session (Bados et al., 2007; Barrett et al., 2008; Moller et al., 2019; Schleider et al., 2023). Rather than focusing considerable effort on changing this norm of low adherence, it may be worth considering what can be offered, and what can be effective, within this timeframe in order to make best use of participants' limited engagement.

Measuring engagement with self-guided online interventions poses a unique challenge as engagement with the technology may not translate into engagement with the program's content. Website metrics provided information relating to the time spent completing online activities, yet the extent to which participants experienced a deeper level of cognitive absorption is unknown. This deeper interaction with online interventions is what Yardley et

al. (2016) terms "effective engagement" and is the prelude to desired behavioural change (Short et al., 2018). In the FMP, this translates to the intentional usage of the program rather than simply the number of sessions completed. The FMP's host platform, Wix, is principally used for e-commerce and it was not possible to discern how long participants spent actively engaging with the program, compared to how long their web browser was open on the site. Similarly, the usage metrics could not determine participants' level of engagement (superficial or comprehensive) or whether skills and techniques were employed outside the sessions. Ideally, more sophisticated software is needed to record and analyse participant behaviours in relation to how they interact with the program. Interest, immersion, and intervention usage are all important components for effective engagement. Attention checks, reflective learning questions following each module, and measures of behavioural change outside of the program would be highly informative and provide a better understanding of the real-world implications and behaviour changes participants experienced as a result of engaging with the program.

Future Research

A general recommendation for intervention trials moving forward is to employ an implementation framework in the evaluation phase. Online interventions have the potential to revolutionise access to and use of mental health care, but only if it is guided by appropriate feasibility testing and implementation frameworks. Implementation frameworks should be used to critique all implementation attempts, including successes and failures, as a great deal of information can be learnt from both. Doing so will lead to more accurate and comprehensive assessments of the effectiveness of interventions (Park et al., 2022). Without which, online mental health care may pose to become more problematic than face-to-face services due to the lack quality control, poor acceptability, and unsustainable implementation practices.

A Dismantling Approach for Perfectionism Interventions

Given perfectionism interventions are predominantly of a cognitive behaviour therapy (CBT) orientation (Galloway et al., 2022; Robinson & Wade, 2021; Shafran et al., 2023), a dismantling approach can be adopted to identify which elements of the therapy are active mechanisms of change (Papa & Follette, 2015; Pennesi & Wade, 2016). In the first instance, CBT for perfectionism (CBT-P) may be compared as multicomponent therapy against its individual constituents, to investigate whether isolated components can produce meaningful change and serve to function as shorter or single-session versions of CBT-P. Additionally, a dismantling approach may involve comparing CBT for eating disorders (CBT-E) with and without CBT-P. Doing so will allow future investigations to determine whether the addition of a perfectionism component adds significant benefit, or to what degree addressing perfectionism moderates the effect of by CBT-E, and for whom. Additionally, further investigation in at-risk individuals is required using an early intervention approach to compare eating disorder interventions versus stand-alone perfectionism interventions in terms of acceptability and efficacy. A direct comparison of transdiagnostic treatment against disorder-specific treatment may help to inform whether differences exist between treatment acceptability and the reduction of clinical symptoms when tackling a specific disorder versus a transdiagnostic factor. Such a comparison may help to also determine which at-risk profiles would be appropriate to each type of intervention based on the presence of predictors or moderators.

Investigating Moderators

Future perfectionism trials may consider investigating and identifying treatment moderators to help determine where internet interventions should sit in the stepped-care approach, for whom internet interventions are predicted to be most effective, and what are the

predictors of poor response that will likely warrant more intensive treatment options. Identifying moderators in the particular context of indicative ED prevention is needed to understand what will work best for this targeted demographic (Bauer & Moessner, 2013) and may serve to reduce the substantial amount of heterogeneity identified in the two meta-analyses conducted on perfectionism interventions (**Chapter Three**; Galloway et al., 2022). Moderation and mediation analyses have been conducted elsewhere to identify predictors of response to digital interventions for EDs, yet no robust moderators or mediators have been identified (McClure et al., 2023). Research into moderators for perfectionism interventions is still in its infancy and no predictors have yet been established for what will impact a participants' uptake or response to a perfectionism intervention (Galloway et al., 2022; Robinson & Wade, 2021). The lack of current evidence is likely due in part to the lack of diversity in populations who are included in perfectionism intervention feasibility and efficacy trials. Greater efforts are needed to include and represent diverse populations in studies of perfectionism and disordered eating, and to investigate whether age, culture, or sex, moderate the effects of perfectionism treatment. A greater number of, and diversity within, perfectionism studies is required to permit the investigation of moderators. It would be advantageous for perfectionism intervention researchers to routinely include a measure of disordered eating in their secondary outcomes in addition to the more typical measures of negative affect. Briefer versions of the EDE-Q now exist (Jenkins & Davey, 2020) which can be added to an assessment package without unduly increasing respondent burden. Further research may look to investigate moderators of attrition and adherence, as well as clinical outcomes, to determine who will respond to, and benefit the most from, online perfectionism interventions. A comprehensive review of the literature, as well as future moderator analyses, is needed ahead of future implementation trials for perfectionism programs. Until then, the question remains open as to who would most benefit from online perfectionism treatment.

Improving Equality of Online Mental Health Interventions

Current perfectionism research is marked by a lack of ethnic diversity and limited representation of male and non-binary participants. In the systematic review (**Chapter Three)** females accounted for the majority population (61-100%) across all studies and in the systematic review by Galloway et al. (2022) females accounted for 82% of the population across 15 RCTs targeting perfectionism. Difficulties with obtaining a diverse sample continues to appear in current perfectionism trials, as seen in Rozental et al. (2024) with a 93.5% female sample. Caucasian, female, and having tertiary level education tends to be to the most oversampled demographic across research trials (Beatty & Binnion, 2016; Cross et al., 2022; Leslie et al., 2022).

Whilst the issue of demographic diversity was addressed in the RCT and implementation trial, broader changes are needed in research trials and in perfectionism research. The use of predominantly young, female, and Caucasian participants limits the generalisability of studies investigating the efficacy and acceptability of mental health interventions. Digital health care has the potential to increase engagement amongst minoritized and underserved communities where access to culturally appropriate clinical care may be limited (Park et al., 2022; Shroff et al., 2023). Currently, uptake of digital mental healthcare is lower in minority groups which may result from services not being culturally appropriate, limited promotion and awareness of programs being offered, or as a result of these populations being disproportionately affected by the barriers to accessing online interventions (Ellis et al., 2022; Molloy et al., 2021; Radu et al., 2023; Shroff et al., 2023). Inequities in accessing online mental health care may include poor digital literacy, lack of access to sufficient internet or technology resources, and limited English language proficiency (Anjum et al., 2016; Whitehead et al., 2023). Acceptability and feasibility testing

needs to explore barriers specific to underserved and minority populations, which can only occur if these demographic groups are targeted in research. Without assessing feasibility, engagement, and acceptability amongst minoritised communities, online mental health care will not progress to serve those who do not readily engage with services and instead will continue to support the pre-existing inequities found in traditional mental health care (Radu et al., 2023; Park et al., 2022). Only by addressing systemic barriers, providing culturally adapted programs, and increasing digital health literacy will online mental health care serve to close the treatment gap.

Perfectionism Interventions in Clinical Eating Disorder Populations

Accessing treatment for an ED poses some unique barriers which impede treatment uptake (Ali et al., 2017; Ali et al., 2020; Hamilton et al., 2022; Radunz et al., 2024). Providing online perfectionism treatment for EDs may form part of the solution to the treatment gap if clinical utility can be established in this population. The systematic review (**Chapter Three**) highlighted the paucity of research conducted as to the effect of perfectionism interventions in clinical ED populations. Since Lloyd's (2015) review of perfectionism studies, a single study was produced which investigated a target population with body image concerns (Johnson et al., 2019). Yet unlike its predecessor (Steele & Wade, 2008), this study did not require participants to meet the full diagnostic criteria for an eating disorder. Since the systematic review was conducted, emerging research continues to investigate the use of perfectionism as a preventative treatment for EDs (O'Brien et al., 2022) as well as preliminary evidence supporting the feasibility of perfectionism treatment for adolescents with a diagnosed ED (CBT-P-ED; Egan et al., 2023) and as a subcomponent in metacognitive training for adolescents with a diagnosis of anorexia nervosa (Balzan et al., 2023).

As yet, however, efficacy testing of perfectionism as an independent treatment, and not as a sub-component of a larger intervention with a multifaceted approach, has not taken place in clinical ED populations. This lack of current evidence highlights the need for future research to focus on the use of perfectionism interventions as treatment as well as an early intervention approach. Due to the FMP's success in participants with high weight and shape concern, a next step could involve trialling the program in a clinical context. The self-guided nature of the FMP makes it possible for the intervention to be offered to individuals not currently engaged in treatment or as a preliminary, adjunct, or exit strategy to face-to-face

therapy. Future effectiveness trials can assist in determining whether perfectionism interventions have greater impact as a separate or adjunct treatment option. Future real-world usage of the FMP could see it forming part of a stepped care approach or offered to individuals waitlisted for ED services. Secondary benefits of treating EDs through a transdiagnostic approach could include the simplification of clinical training, shorter treatment duration, and the reduction of comorbid symptoms which serve to maintain or exacerbate EDs (Wade et al., 2023).

Investigating an Alternative Delivery Format of the FMP

One possible explanation for the poor adherence and uptake rates in the FMP trials conducted could be due to multi-session treatment programs not meeting the preferences of end-users due to the perceived high level of commitment required to complete an entire program. Adapting the program to meet end-user preferences could involve reformatting the FMP into a more easily digestible series of stand-alone sessions, known as single session interventions (SSIs). SSIs are designed with the intent to provide a structured session, which can yield meaningful clinical impact, in a single encounter (Schleider et al., 2020). SSIs may serve to target one core component or maintaining factor for a disorder, or introduce a single therapeutic skill, in a given session. This seceded approach lends itself to the modular format of the FMP and offers the potential for participants to engage in multiple single sessions whilst simultaneously reducing the outright commitment of the FMP and reducing the number of participants who would otherwise be classified as non-adherers (Shafran et al., 2023). SSIs show modest effects for their use in EDs (Schleider & Weisz, 2017) and short-term efficacy in improving body acceptance and disordered eating (Pennesi & Wade, 2018; Schleider et al., 2023; Zhou et al., 2020). Efficacy has yet to be established for the use of SSIs in treating perfectionism (Ward & Wheaton, 2022). Conversely, SSIs may serve to

increase the likelihood of initial and subsequent engagement with mental health services (Cohen et al., 2023) by providing a low-barrier first encounter with an early intervention service, by assisting participants to access further support (Schleider et al., 2023), or by increasing online intervention acceptance (Linardon et al., 2020). Despite the potentially lower efficacy of SSIs compared with longer treatment programs, switching the delivery format of the FMP to SSIs may be favourable due to the brevity, scalability, and potentially greater acceptability of this format option.

Improving Adherence Through Guidance

Previous research has indicated that symptom reduction is dose dependent. As such, completing more modules of the FMP would likely increase the effect size on both perfectionism and associated mental health concerns (Wade et al., 2019). As completion rates were poor for the FMP across the RCT and implementation study, future iterations of the FMP may explore options for improving program adherence. Providing support has been consistently shown to improve adherence to online interventions (Baumeister et al., 2014; Musiat et al., 2022), but at the cost of the program's scalability and resource requirements. As such, future research should investigate to what extent and in what format support can be offered without losing these benefits. Limited evidence has investigated what effect moderating the intensity of guidance has on outcomes and adherence, but offering more frequent support has yet to be shown to result in greater improvements (Baumeister et al., 2014; Klein et al., 2009). Subsequently, low-intensity options for support may include on demand or technology-assisted guidance. On demand guidance relies on intervention users to contact the program's support providers if help or clarification is needed. Evidence for the superiority of scheduled or on demand support for adherence is mixed, but on demand support has been demonstrated to be as effective as scheduled support for symptom reduction

(Dahlin et al., 2022; Hadjistavropoulos et al., 2019). Support on demand may be preferential as the level of guidance may differentiate between participants (Hadjistavropoulos et al., 2019) or fluctuate over the course of a program (i.e., higher at the beginning of an intervention; Baumeister et al., 2014).

Dismantling studies are needed to ascertain the nature of guidance which is most beneficial in online perfectionism interventions and what is the minimum level of human contact required to improve the likelihood of receiving a full dose of treatment. Alternatively, online interventions are starting to benefit from the use of advanced computational and artificial intelligence (AI) methods. AI-assisted technology can be employed to provide users with tailored feedback, identify changes in risk, send automated reminders, track engagement, suggest tailored therapeutic content, and interact with users via chatbots (Achilles et al., 2020; D'Alfonso et al., 2017). If the provision of support is purely to increase adherence rather than offer therapeutic contact, AI-assisted technology is sufficient to fulfill this role (Fairburn & Patel, 2017). By negating the need for clinicians to be available, AI-assisted therapies may be the solution to maintaining scalability and improving low adherence rates for online programs.

Improving Marketing for Evidence-Based Interventions

A major advantage of online interventions is the availability of advanced software features which can increase end-user engagement. Instantaneous feedback, symptom tracking, gamification as well as marketing strategies such as the use of social media ambassadors and video advertisements are just some of the methods by which online programs can be made to appear engaging and appealing to end-users. All the aforementioned strategies are applicable for perfectionism interventions and trialling their implementation may spark further research into what can be done to increase sub-optimal rates of uptake and

engagement amongst potential users. However, a substantial gap exists between the availability of these commercial tools and what is routinely used in research to promote and recruit for online MHIs, as evidenced by the lack of these strategies in the articles reviewed in the scoping review. Likely the gap between the strategies used in industry, and what is used in trial settings, is due to differences in funding and the lack of commercialisation of research-funded interventions. The implementation trial and scoping review provide a starting point for improving unsuccessful or partially successful recruitment efforts, but future research may look to synthesise and consolidate available evidence from outside traditional research trials or peer-reviewed literature. It is highly possible that more could be learnt about how to improve the implementation process by looking at industry and commercial marketing strategies. Further research is needed to enhance the dissemination of online treatments and make this option appealing to both providers and users. Online mental healthcare will continue to grow in an increasing sophisticated digital world, particularly post-COVID19 where the need for online and on-demand support is better realised, and where the current available face-to-face services cannot meet the growing need of consumers (Wind et al., 2020). It is likely funding will continue to invest in digital healthcare access and online interventions may yet become an effectively disseminated and preferred treatment option.

Conclusion

An imperative exists to address the high prevalence rates of EDs and disordered eating in young adults, and the low rates of treatment access and uptake (Phillipou et al., 2023). Using an early intervention transdiagnostic approach has been shown in this thesis to have potential as an avenue for tacking disordered eating from a "side-door" approach. This thesis has contributed to the growing understanding of both the merits and challenges of using online perfectionism interventions. Perfectionism is an efficacious point of intervention

which serves to reduce multiple symptoms of psychological distress. However, accessibility, engagement, and sustainability of interventions is problematic across all areas of mental health care, yet offering online approaches has not fixed these issues. Rather, it simply presents a new set of challenges specific to online treatments. Research to date has worked to identify individual and systemic barriers, and the growing fields of implementation science and digital mental healthcare are investigating options which endeavour to improve the use of online programs. Continued efforts to resolve these barriers is paramount to effectively make use of this valuable intervention option and substantial support is needed for online interventions to be adopted into routine care. Suggested improvements in the field include addressing the relevancy, visibility, and advocacy of online programs, particularly during the early stages of pilot testing. Future research tackling the aforementioned areas can inform the use of online perfectionism programs as an acceptable, flexible, and effective intervention option both for those at-risk of and those with an ED.

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APPENDICES

Appendix A: Published Study One

Accepted manuscript referenced in **Chapter Two**, **Three**, and **Nine.**

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21st January 2021

Perfectionism Interventions Targeting Disordered Eating: A systematic review and meta-analysis

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Data Availability Statement: The data that support the findings of this study are available from the corresponding author upon reasonable request.

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Running Head: Perfectionism Interventions for Disordered Eating

Abstract

Objective: Perfectionism is a risk factor for depression, anxiety, and eating disorders, and perfectionism interventions show evidence of the impact on the development and maintenance of these disorders. A systematic review and meta-analysis were conducted of studies using perfectionism interventions that included measures of disordered eating/body image concerns. The primary aim was to investigate the impact on perfectionism and disordered eating/body image concerns, with a secondary aim of examining the impact on depression and anxiety. **Methods:** The systematic review was conducted using Medline, PsycINFO, and Scopus. Grey literature was sought via ProQuest Dissertations and Theses Global. Effect size estimates for the meta-analysis were calculated using between- and within-group comparisons. **Results:** Eight studies were included in the between-group analysis and nine studies for the within-group analysis. Perfectionism interventions were effective in reducing perfectionism and disordered eating with large effect sizes, and in reducing depression and anxiety with moderate effect sizes. Studies included both clinical and non-clinical populations. Substantial heterogeneity was present across most analyses. **Discussion:** Eating disorder treatments may benefit more from the inclusion of perfectionism interventions than depression and anxiety treatments. Possible reasoning for these variations between symptom reduction is discussed. This report provides important early evidence for the efficacy of perfectionism interventions, however, the limited number of publications in this area, the presence of heterogeneity, and lack of diversity in participant populations limits the generalisability of these findings. Future research is needed to determine whether eating disorder treatments may benefit from the routine inclusion of a perfectionism component.

Introduction

Perfectionism is a multi-faceted construct with key components including high personal standards, excessive concern over mistakes, fear of negative evaluation, and self-criticism (Frost, Marten, Lahart, & Rosenblate, 1990). The terms perfectionistic standards (PS) and perfectionistic concerns (PC) have been suggested to conceptualise the two dimensions of perfectionism identified in factor analyses (Smith & Saklofske, 2017). PS encompasses high personal standards and self-oriented forms of perfectionism, whereas PC is associated with concerns over mistakes, doubts about actions, and socially prescribed perfectionism (Stoeber & Otto, 2006). Perfectionism has been described as both an adaptive and maladaptive trait (Bieling, Israeli, & Antony, 2004; Trumpeter, Watson, & O'Leary, 2006) but evidence suggests that both PC and PS are associated with negative impacts on mental health, higher levels of neuroticism, and greater perceptions of stress (Enns, Cox, Sareen, & Freeman, 2001; Limburg, Watson, Hagger, & Egan, 2017). Emerging evidence suggests that working to achieve high (as opposed to perfectionistic) standards exists separately from perfectionism and is not considered harmful (Blasberg, Hewitt, Flett, Sherry, & Chen, 2016; Flett & Hewitt, 2006; Gaudreau, 2019; Osenk, Williamson, & Wade, 2020).

Perfectionism is considered a transdiagnostic risk factor for multiple psychopathologies, including obsessive compulsive disorder (OCD), depression, anxiety, and eating disorders (EDs) (Bardone-Cone et al., 2007; Egan, Wade, & Shafran, 2011; Sassaroli, Gallucci, & Ruggiero, 2008; Shafran, Cooper, & Fairburn, 2002). Perfectionism is a proposed risk factor both in the development and maintenance of eating disorders as it precedes disorder onset and is present throughout the disorder and early stages of recovery (Bardone-Cone, Sturm, Lawson, Robinson, & Smith, 2010). Perfectionism has a marked impact on ED

maintenance through its association with overvaluation of shape and weight (Smith, Simmons, Flory, Annus, & Hill, 2007). Shape and weight overvaluation formulate the belief that accomplishing a lower order and tangible goal (e.g., eating less than 1000 calories a day) is imperative to accomplishing a higher order and more abstract goal (e.g., the feeling of being in control). As such, when lower order goals are not achieved, higher order goals are also viewed as unattainable, leading to greater psychological distress (Watson, Raykos, Street, Fursland, & Nathan, 2011). Targeting perfectionism is hypothesised to reduce disordered eating in both at-risk populations who experience disordered eating without meeting the criteria for a clinical diagnosis, and in those who have a diagnosis of an ED.

Two meta-analyses have so far investigated the impact of perfectionism interventions on various psychopathologies. A 2019 review by Suh, Sohn, Kim, and Lee examined depression and anxiety symptoms, incorporating ten studies which utilised face-to-face and online interventions to target perfectionism. Eight of the studies targeted a population with elevated perfectionism, one study targeted individuals with an eating disorder diagnosis, and one targeted elevated perfectionism and a diagnosis of OCD. Their analysis focused solely on the comparison of intervention groups to control groups (between-group analysis) to provide estimates of the efficacy of perfectionism interventions in reducing symptoms of perfectionism, depression, and anxiety. Effect size estimates indicate both perfectionistic strivings (g= -0.48, 95% CI: -0.71, -0.25) and perfectionistic concerns (g= -0.55, 95% CI: -0.83, -0.26) are responsive to interventions as are symptoms of depression (g= -0.62, 95% CI :-1.04, -0.20) and anxiety (g= -0.49, 95% CI: -0.74, -0.24). These findings are congruent with an earlier meta-analysis performed by Lloyd, Schmidt, Khondoker, and Tchanturia (2015) which was conducted using pre-post trial results (within-group analysis) only. They noted a moderate reduction in anxiety (g= 0.52, 95% CI: 0.23, 0.81) and depression (g = 0.64, 95% CI: 0.35, 0.92), and a large reduction in perfectionism (concern over mistakes g= 1.32, 95%

CI: 1.02, 1.64, personal standards g= 0.79, 95% CI: 0.44, 1.12, self-oriented perfectionism g= 0.81, 95% CI: 0.41, 1.20). Eating disorder symptoms were also partly investigated; only one study was included that addressed the use of perfectionism interventions to reduce disordered eating (Steele & Wade, 2008), in individuals with a diagnosis of Bulimia Nervosa. Reductions in objective binge episodes (g= 0.32), purging (g= 0.50), and shape and weight concerns (g= 3.96) were observed post-intervention.

Since the publication of Lloyd's 2015 review, an increased number of studies have examined the impact of a perfectionism intervention on disordered eating and/or body image. Hence the first aim of this research is to conduct a systematic review and meta-analysis of these studies (which are a subset of all studies examining the impact of perfectionism interventions) in order to ascertain effects sizes for both perfectionism and disordered eating/body image. A secondary aim was to investigate the impact of perfectionism interventions on depression and anxiety in order to compare the differential impact treating perfectionism has on disordered eating. We provide both between- and within-group effect sizes to offer comparisons to the two previous meta-analyses. In addressing these aims, this study intends to provide direction for future research in this area.

Method

Search Strategy

A manual literature search was conducted in August 2020 by the first author using Scopus, Medline (Ovid), and PsycINFO. The search terms (appearing in either title, abstract, subject heading or keyword) included (perfect*) AND (treatment OR therap* OR intervention* OR prevention* OR trial* OR analysis or evaluat*) AND (anorexi* OR

bulimi* OR "eating disorder*" OR "disordered eating" OR ((weight OR body) ADJUNCT TO (image OR concern OR dissatisfy*) OR dysmorph*). A grey literature search was conducted using the same search terms through the database ProQuest Dissertations and Theses Global. Additionally, attempts were made to contact the authors of the papers included in the meta-analysis to enquire about relevant unpublished or ongoing research.

Eligibility Criteria

Studies were considered eligible for systematic review if they evaluated a perfectionism intervention that included disordered eating or body image as an outcome measure, regardless of whether the format was a case series, randomized control trial, qualitative assessment, or other. The studies needed to be written in English and published in peer review journals, irrespective of whether the results published were qualitative or quantitative. Subsequent inclusion in the meta-analysis required only the studies which produced quantitative data for use in calculation of an intervention effect size, and which offered perfectionism treatment as a standalone rather than augmented treatment. All papers which did not include measures of symptom severity for both disordered eating/body image and perfectionism were excluded at the final phase of screening for the meta-analysis. Studies were excluded if they were based on a pediatric (pre-adolescent) population, did not provide multiple sessions of perfectionism treatment, or addressed perfectionism as a sub-component of a larger intervention with a multifaceted approach. Paediatric populations were excluded from this meta-analysis due to a lack of evidence supporting the reliability and validity of using perfectionism measures in this age group (Leone & Wade, 2018). Child-specific measures of perfectionism remain largely untested for construct validity and the appropriateness of using an adult conceptualisation of perfectionism in children is unknown.

Further clarification is needed as to how perfectionism should be measured in children before including this population in a systematic review.

Meta-analyses

Two meta-analyses were conducted using a random effects model for the constructs of perfectionism, eating disorder behaviours, depression, and anxiety. Effect size (ES) estimates were calculated for both within-group and between-group data. Within-group estimates compared pre- and post-trial scores in the intervention group, as reported in the previous meta-analysis of perfectionism interventions (Lloyd et al., 2015) to permit comparability to these results. The between-group estimates compared post-trial scores of the intervention group against the control group. Where values were not available or could not be calculated from the published data, the paper's authors were contacted to request the missing information. All requests were complied with, allowing for all studies to be included in the meta-analysis. One study (Johnson et al., 2019) did not use a control group and was excluded from the between-groups analysis.

The Comprehensive Meta-Analysis Program Version 3 (Borenstein, Hedges, Higgins, & Rothstein, 2013) was used to calculate all statistics relating to the meta-analysis (forest plots, heterogeneity, publication biases) excluding the correlation coefficients. Due to the small number of studies included in this analysis ($n <10$), Hedge's g was chosen over Cohen's d as the estimate for ES. The calculation for Hedge's g applies a correction factor (J), which is not found in the formula for Cohen's d, which allows for a less biased estimate of ES in small samples (Borenstein et al., 2013). ESs were computed using group means (M_1 and M_2), group standard deviations (SD_1 and SD_2), sample size (n_1 and n_2), and a correction for the correlation between pre- and post-measures (r).

Where studies included more than one measure of perfectionism, preference was given first to the Frost Multidimensional Perfectionism Scale- Concern over Mistakes subscale (FMPS-CM) as this measure was expected to give the most reliable representation of perfectionistic concerns and is a commonly reported measure, allowing for more reliable and accurate cross-study comparison (Bulik et al., 2005). Measures designed to assess eating disorder behaviours or body image concerns were included for the purpose of analysis as they both relate to the generalisable construct of disordered eating (or shape and weight concern). Body image measures were reported in three studies and the global Eating Disorder Examination Questionnaire (EDE-Q; Fairburn & Beglin, 2008) was used in the remaining six studies which assessed eating disorder behaviours. In studies using multiple measures of eating disorder behaviours or body image concerns, preference was given to EDE-Q as the most commonly reported measure, allowing for reliable cross-study comparison.

Correlation calculations for within group effect sizes

Within-group effect sizes were not reported for seven of the nine papers. In order to conduct a meta-analysis of the pre-post intervention effects, a correlation coefficient was calculated for each construct and applied across all nine studies. In doing so, the within-group effect sizes were calculated adjusting for the intra-individual/repeated measures effect. In order to estimate the correlations between measures, the pre-treatment and post-treatment (12-week follow-up) data from Shafran et al. (2017) was used as the basis for this analysis. Analyses were conducted using the IBM statistics software SPSS (Version 25). Estimates were obtained using linear mixed-effect models (LMM) which required fewer assumptions than repeated-measures ANOVA and accommodated for missing data using a maximisation likelihood. Correlates were estimated using an intent-to-treat analysis and included all cases where data was missing from one or more timepoints. Of the 62 participants who were

randomised to treatment in Shafran et al.'s (2017) study, 31 (50%) did not complete the post-treatment measures.

Heterogeneity

Q and I^2 were calculated to determine heterogeneity; I^2 expresses the percentage of variability attributable to heterogeneity rather than sampling error. Possible values range from 0-100% with higher values representing greater heterogeneity. Measures of heterogeneity are susceptible to substantial bias when few studies are included. Hence, I^2 should be interpreted cautiously and within the context of the meta-analysis, addressing for potential reasons for heterogeneity (von Hippel, 2015).

Publication Bias

Publication bias was assessed using Egger's test (Egger, Smith, Schneider, & Minder, 1997). Egger's test provides a Y intercept (from linear regression) which, if significantly different from zero, indicates publication bias is likely present.

Quality Assessment

All studies included in the final meta-analysis were assessed for quality using the Consort 2010 checklist for reporting a pilot or feasibility trial (Eldridge et al., 2016). As the meta-analyses comprised of case series and randomised control trials (RCTs), a subset of nine items were selected, from the original 40, which were applicable to all study types. The selected items were: (Item 4a) Eligibility criteria for participants; (Item 5) The interventions for each group with sufficient details to allow replication, including how and when they were actually administered; (Item 7a) Rationale for numbers in the pilot trial; (Item 13a) For each group, the numbers of participants who were approached and/or assessed for eligibility, randomly assigned, received intended treatment, and were assessed for each objective; (Item

13b) For each group, losses and exclusions after randomisation, together with reasons; (Item 15) A table showing baseline demographic and clinical characteristics for each group; (Item 16) For each objective, number of participants (denominator) included in each analysis. If relevant, these numbers should be by randomised group; (Item 17) For each objective, results including expressions of uncertainty (such as 95% confidence interval) for any estimates. If relevant, these results should be by randomised group; (Item 26) Ethical approval or approval by research review committee, confirmed with reference number. The checklist was applied using a coded response with items given a 'Y' if criteria was met, an 'N' if criteria was not met, and a 'P' if criteria was partially fulfilled.

Additionally, a second quality assessment tool was used to specifically assess the quality of RCTs included in the meta-analysis. The Cochrane Risk of Bias (II) tool assesses individually randomised, parallel group trials, and provides a rating to differentiate those of 'Low' versus 'High' or 'Some' concern for risk of bias (Higgins et al., 2011). All items from the Cochrane Risk of Bias tool were included.

<div align="center">

Results

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Systematic review

As shown in **Figure 1**, the search identified 881 studies with 28 studies identified as potentially relevant. From the grey literature search, one additional unpublished study (currently under review for publication) was provided by a contacted author. Fifteen studies were included for systematic review and the study characteristics summarised in **Table 1**. Studies within this broader category were published between 2008-2020 and included eight

randomised trials, five case series, one qualitative assessment, and one non-randomised controlled comparison. Self-guided treatments accounted for one-third (n= 5) of the programs whilst two-thirds (n=10) were guided by a clinician or researcher. All studies (where specified) provided cognitive behavioural therapy as the basis of the intervention. The primary outcomes clustered around symptom reduction (ED: n= 4, perfectionism: n= 6, ED and perfectionism: n= 1) and intervention feasibility (n= 4). Participants were recruited from ED outpatient services (n = 3), ED inpatient services (n = 3), and non-clinical settings (n= 9). Nine interventions were conducted face to face and six used an online format.

Meta analyses

Nine of the fifteen studies were selected for the meta-analysis. Five studies were excluded for offering augmented or concurrent treatment and one qualitative study was excluded. The final selection included one case series, one non-randomised controlled comparison, and seven randomised trials.

Study Characteristics

Demographic information is provided in **Table 1b** and studies included in the meta-analysis are represented with an asterisk. Across the nine studies 720 participants were included (88.6% female sample) with the mean age of participants ranging from 15-37 years old (total mean age= 24.9 years). More than half the studies recruited through secondary or tertiary educational institutes, resulting in a 48.9% (n = 352) student participant population. Information was not routinely reported regarding marital status (n = 2), socioeconomic status (n = 1), and ethnicity (n = 4). Where this information was provided, participants were majority Caucasian (44-77%) and single (58-73%).

Within group effect sizes

315

In order to account for the correlation between measures in a pre-post sample, a correlation coefficient was applied to all within-group ES estimates. These correlations were: Perfectionism, $r = 0.394$; ED, $r = 0.643$; Depression, $r = 0.513$; Anxiety, $r = 0.394$. As shown in **Table 2**, and **Figures 2 and 3**, perfectionism interventions were associated with large and significant effect size decreases in symptoms of perfectionism and disordered eating. Significant and moderate effect size decreases for symptoms of depression and anxiety were observed (**Supplementary Figures 1 and 2**).

Between group effect sizes

Displayed in **Table 2**, and **Figures 4 and 5**, perfectionism intervention cohorts experienced significantly greater reductions in perfectionism and disordered eating compared to comparison groups. There was no significant difference in symptoms of depression and anxiety when compared to control condition cohorts (see **Supplementary Figures 3 and 4**). Between-group results for disordered eating and perfectionism were further investigated using post-hoc analyses. The between-group meta-analyses were split into several sub-groups in an attempt to reduce heterogeneity, these groups were: RCTs studies only (n = 6), self-guided studies only (n = 5), online studies only (n = 5), and studies which used the EDE-Q (global) as a disordered eating measure (n = 6). No significant or clinically relevant alterations came from these attempts to subdivide the studies into more homogenous samples. **(Supplementary Figures 5)**.

Heterogeneity

Significant heterogeneity was found across all analyses, ranging from 62-93%, except for between-group comparisons of anxiety. Q and I^2 values are reported in **Table 2**.

Publication Bias

Publication bias was present in all within-group analyses, as shown by Egger's test in **Table 2**. Publication bias was not apparent for between-group comparisons related to disordered eating, depression, and anxiety but was evident for perfectionism. Due to the presence of substantial heterogeneity, further analysis of publication bias (i.e. the *Trim and Fill* approach by Duval and Tweedie) could not be performed.

Quality Assessment

Study quality was rated across nine items selected from the full Consort 2010 checklist (see **Supplementary Table 1**). The results of the first quality assessment, addressing all studies included in the meta-analysis, are summarised in **Figure 6**. The average number of items achieved ('Yes' responses) for each study was six (range two to eight), the average number of items not achieved ('No' responses) was two (range zero to five). The only item unmet by the majority (>50%) of studies was the inclusion of a baseline demographics table describing participants. Age and gender were the only demographic factors routinely reported.

The Cochrane Risk of Bias (II) tool was applied to six RCTs included in the meta-analysis. Of the six analysed, one study received an overall bias rating of 'Low' and the remaining five were of 'Some' concern. The area of greatest concern, where risk of bias was rated as 'High' for two of the six RCTs, was the handling of missing outcome data (**See Supplementary Figure 6**).

Discussion

The purpose of this review and meta-analysis was to assess studies which used perfectionism interventions to impact upon symptoms of perfectionism and disordered eating.

For comparison with two previous meta-analyses, this review analysed both within-group and between-group effect estimates to determine the efficacy of perfectionism interventions for reducing perfectionism, disordered eating, depression, and anxiety. The results indicate perfectionism interventions were associated with a large effect for reducing perfectionism and disordered eating (between-group and within-group analyses), and a moderate effect for reducing depression and anxiety (within-group analyses only). These outcomes are consistent with the earlier findings by Lloyd, Fleming, Schmidt, and Tchanturia (2015) and Suh, Sohn, Kim, and Lee (2019) who reported comparable ES estimates in their meta-analyses for depression, anxiety, and perfectionism. The results of this meta-analysis built upon the suggestion from Lloyd et al. (2015) that disordered eating symptoms could be reduced in a population diagnosed with Bulimia Nervosa using a perfectionism intervention. This updated analysis indicates disordered eating is responsive to perfectionism treatment in clinical and non-clinical populations.

Results from this review should be interpreted with caution as high heterogeneity was found across all analyses but one. Reasons for heterogeneity were unable to be explored, through meta-regression, due to the small sample size and lack of potential moderators reported within the selected studies. Attempts were made to reduce heterogeneity by subdividing the studies from the between-group meta-analyses into groups based on design, demographic, or outcome variables. Heterogeneity remained high across all subdivided analyses. Heterogeneity may result from statistical, clinical, or methodological factors, or the presence of publication bias (Fletcher, 2007). While Egger's test results indicate the presence of publication bias, these findings are inconclusive unless all other reasons for possible heterogeneity can be excluded. Due to the nature of this review, few studies were available for inclusion and variations existed in the studies' designs, interventions, outcome measures, and participant selection criteria. Target populations included a mix of elevated

perfectionism, elevated disordered eating/body image concerns, non-clinical/self-identified perfectionists, and high school students with no clinically relevant traits. These variations suggest clinical heterogeneity may have been a contributing factor, however, a greater number of studies are needed to distinguish the cause or causes of heterogeneity and whether publication bias was genuinely present. Despite this limitation, this meta-analysis provides important early evidence as to the potential efficacy of perfectionism interventions as a transdiagnostic treatment tool across a variety of participant demographics and study designs. Given the preliminary nature of these findings, understanding the impact of moderators would provide a valuable addition to this research. Moderators may account for unexplained variance (heterogeneity) and have clinical implications regarding to how to best implement perfectionism interventions to a targeted audience. Potential moderators for future investigation include: sex, age, duration of disordered eating behaviours, clinical versus non-clinical groups, dimensions of perfectionism experienced (PS, PC, or both), study design, intervention modality, and study quality.

One explanation for why perfectionism interventions appear to have a greater impact on disordered eating than depression and anxiety is that perfectionism does not impact on the latter to the same extent as it does the former. It is likely the contribution of perfectionism to the development and maintenance of various psychopathologies is idiosyncratic. This notion is supported by Limburg et al. (2017) who demonstrated using path analysis that PC and PS were not equally correlated with depression, anxiety, and eating disorders. Both dimensions of perfectionism uniquely explain disorder symptoms, however, PS was shown to contribute minimally to depression and anxiety, and to correlate to a larger degree with Anorexia Nervosa and Bulimia Nervosa. As perfectionism interventions reduce both dimensions of perfectionism (Suh et al., 2019), eating disorder symptoms may reduce to a greater extent because a greater portion of the contributing factors are being targeted. Alternatively,

perfectionism may impact a wider and more diverse range of components in disordered eating than in depression or anxiety. Perfectionism may serve to maintain disordered eating through perfectionistic standards being applied to multiple areas such as exercise (i.e. completing the perfect number of hours or intensity of exercise), diet (i.e. eating to a perfect meal plan or calorie intake) and appearance or the overvaluation of shape and weight (Smith et al., 2007; Watson, Raykos, Street, Fursland, & Nathan, 2011).

Perfectionism appears as a key transdiagnostic component in models of eating disorders that have influenced effective treatment development (Fairburn, Cooper, & Shafran, 2003; Pennesi & Wade, 2016; Schmidt, Wade, & Treasure, 2014). The greater influence of perfectionism interventions on disordered eating may have implications for improving the efficacy of treatment in eating disorders. Perfectionism interventions are viewed as a valuable adjunct to therapy for eating disorders (Fairburn et al., 2009; Hurst & Zimmer-Gembeck, 2019). Whether treatment for eating disorders may benefit from the routine inclusion of a perfectionism component (irrespective of whether perfectionism is an identified issue) is a question that needs to be addressed in future research. The findings from this meta-analysis indicate perfectionism interventions may effectively reduce disordered eating symptoms in populations who are not characterised by high levels of perfectionism. This conclusion, however, was based on divided evidence from three studies (Johnson et al., 2019; Steele & Wade, 2008; Wilksch, Durbridge, & Wade, 2008) and further investigation is needed with studies targeting populations with disordered eating, rather than elevated perfectionism, as their primary concern.

The results of the meta-analysis should be interpreted in the context of three important limitations. First, perfectionism was investigated as a single outcome. Preference was given to analysing the FMPS-CM to allow for greater cross-study comparison, but in doing so it

limited which aspects of perfectionism were explored and provided a unidimensional view of how perfectionism may respond to intervention. Future analyses may wish to take a more multidimensional approach when investigating perfectionism and to separately assess various components, particularly in instances where multiple perfectionism measures are provided. Including multiple measures will clarify which aspects of perfectionism are most responsive to treatment and help to identify which perfectionism measures correlate well with scores (and reductions) of disordered eating.

Second, the information presented in this meta-analysis regarding depression and anxiety was selected as a subsample from the total information available on this topic and should therefore be interpreted within this context. Only studies which assessed depression and anxiety along with a measure of disordered eating or body image concern were included in this review. A more accurate representation of the between-group ES estimates can be found in the analysis by Suh et al. (2019) who previously found a significant impact of perfectionism interventions on reducing depression and anxiety in randomised control trials. The between-group estimates for depression and anxiety in the current study were weaker in comparison to the Suh et al. (2019) study, potentially due to a lack of power. These estimates should be considered only as comparators for within this study, and not as absolute values which fully account for the effect of perfectionism interventions on symptoms of depression and anxiety.

Third, within-group ES estimates, while providing a useful comparison to previous meta-analyses (Lloyd et al., 2015), tend to be less reliable than between-group ES estimates. Within-group analyses are limited by the absence of a control group comparator and are affected by the association between pre- and post-trial data. To account for these limitations, both between-group and within-group ES estimates have been provided for this meta-

analysis, and the relationship between pre-post data was accounted for using estimated correlation coefficients (r). Ideally, correlation coefficients should be calculated for each study to ensure accuracy of the ES estimates. Correlation coefficients, however, were not reported for most studies. Consequently, next best practice was employed (Cuijpers, Weitz, Cristea, & Twisk, 2017) which was to estimate the correlation coefficient for each construct using previous research by Shafran et al., 2017. Using an estimate from a single study introduces biases such that missing data in the Shafran et al. dataset likely impacted the within-group ES estimates. Future studies should consider routinely reporting the correlation coefficient (r) to allow for accurate calculations of ES estimates in within-group analyses.

This meta-analysis summarises the available information regarding the impact of perfectionism interventions on disordered eating and body image concerns. Following this review, a number of suggestions have been proposed as guidance for future research in this area. First, little information is available as to the effect of perfectionism interventions on clinical populations. Since Lloyd's 2015 review, a single study has been produced which investigated a target population with body image concerns (Johnson et al., 2019). Yet unlike its predecessor (Steele & Wade, 2008), this study did not require participants to meet the full diagnostic criteria for an eating disorder. This lack of current evidence highlights the need for future research to focus on the use of perfectionism interventions in clinical populations. Given perfectionism interventions are predominantly of a cognitive behaviour therapy (CBT) orientation, a dismantling approach can be adopted, in the first instance comparing CBT for eating disorders with and without CBT for perfectionism. Doing so will allow future investigations to determine whether the addition of such interventions add significant benefit, and for whom. Second, further investigation in at-risk individuals is required using an early intervention approach in order to compare the impact of an eating disorder versus perfectionism interventions in terms of acceptability and efficacy. Third, current research is

marked by a lack of ethnic diversity and limited representation of males, with females accounting for the majority of participants in all studies (61-100%). The use of predominantly young, female, and Caucasian participants limits the generalisability of these findings. Greater efforts are needed to include and represent diverse populations in studies of perfectionism and disordered eating, and to investigate whether age, culture, or sex, moderate the effects of perfectionism interventions. Fourth, the overall quality of future studies requires improvement, as determined by the use of quality assessment and risk of bias tools, which will consequently result in better estimations of effect. Fifth, more intervention studies are required to permit investigation of moderators which will likely decrease heterogeneity. It would be advantageous for perfectionism intervention researchers to routinely include a measure of disordered eating in their secondary outcomes, in addition to the more typical measures of negative affect. Briefer versions of the EDE-Q now exist (Jenkins & Davey, 2020) which can be added to an assessment package without unduly increasing respondent burden.

This meta-analysis of the impact of perfectionism interventions on disordered eating and body image concerns presents preliminary findings, given the small sample size and high heterogeneity, which invites further investigation and more informed analyses in the future. Nevertheless, these preliminary findings hold promise for the continued use of perfectionism interventions as a transdiagnostic treatment option for disordered eating and body image concerns. There are a great many specific factors to be investigated around how to best utilise this treatment option, who may benefit, and under what conditions.

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Note. References which are labelled with an asterisk signifies those included in the meta-analyses.

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Appendix B: Published Study Two

Accepted manuscript referenced in **Chapter Two**, **Six**, and **Nine.**

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A randomised controlled evaluation of an online perfectionism intervention for people with disordered eating – how perfect does it need to be?

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331

Abstract

Less help-seeking for an eating disorder is predicted by higher levels of denial of, and failure to perceive, illness severity. This research evaluates a "backdoor" approach to early intervention by investigating whether internet cognitive behaviour therapy for perfectionism can significantly improve disordered eating. Additionally, we investigated whether a more interactive intervention impacted outcomes. Participants were recruited worldwide online; 368 were screened, 172 (46.7%) met inclusion criteria (endorsed high shape, weight, or eating concerns) and randomised to an interactive (Focused Minds Program; FMP) or static PDF intervention (Centre for Clinical Intervention; CCI-P) or waitlisted (control condition). Participants completed assessments on disordered eating, perfectionism, and a range of secondary variables at end of treatment, and 1- and 3-month follow-up. Intent-to-treat analyses indicated that, compared to control, FMP resulted in significantly lower levels of disordered eating at each assessment and CCI-P at the 1- and 3-month follow-up (respective 3-month follow-up between group effect sizes of 0.78 and 0.54). There were no significant differences between the two active interventions on any measure except depression and hated self. Results suggests an alternative approach to directly tackling disordered eating that is low-cost is effective, with a more interactive intervention producing a more rapid effect.

Keywords: Perfectionism, disordered eating, intervention, internet, RCT

Introduction

Eating disorders (EDs) are associated with long-term impairments to physical and mental quality of life (Wade et al., 2012) with one of the highest mortality rates of any psychiatric condition (Chesney et al., 2014). The average time between onset of ED symptoms and accessing treatment is 5 years (Hamilton et al., 2022). Depending on the diagnosis, only between 35% and 63% of people with an ED will seek help (Coffino et al., 2019). Access to treatment is lower amongst racial and ethnic minority groups (Kazdin et al., 2017). Help-seeking is lower in ED compared to other mental health disorders such as depression (Tillman & Sell, 2013). Less help-seeking is predicted by higher levels of denial of the severity of illness (Radunz et al., 2023). It has been suggested that interventions that do not directly target disordered eating but seek to reduce the perfectionism that is associated with it (Limburg et al., 2017) can provide a non-confrontational 'backdoor' approach which may be more engaging (Balzan et al., 2023) whilst also being effective (Robinson & Wade, 2021).

The first aim of this randomised control trial (RCT) was to investigate if targeting perfectionism using a self-guided internet Cognitive Behaviour Therapy (CBT) intervention can reduce ED symptoms in a non-clinical sample of young adults. Perfectionism has been demonstrated to be associated with ED symptoms (Bills et al., 2023; Stackpole et al., 2023) which decrease when perfectionism is targeted in treatment (Suh et al., 2019), along with symptoms of depression, anxiety, and self-criticism (Galloway et al., 2022; Robinson & Wade, 2021). Currently there are five RCTs (Grieve et al., 2022; Handley et al., 2015; Kothari et al., 2019; Shu et al., 2019; Valentine et al., 2018) and one prospectively registered RCT (O'Brien et al., 2022) that have targeted perfectionism using CBT and assessed the impact on disordered eating or body image concern. This RCT differentiates itself from these

trials by being the first to target at-risk individuals with elevated weight and shape concerns, rather than selecting participants based on their elevated perfectionism. We predict significant improvements in disordered eating, wellbeing, self-criticism, and negative affect (depression, anxiety, and stress). Young adults were chosen as the target audience for this intervention due to the strong association between the emergence of eating disorders and this age group. Almost half (49%) of all cases of anorexia nervosa emerge over the age range of 19 to 24 years (Grilo & Udo, 2021) and binge-purge disorders increase in prevalence from adolescence to age 25 years (Hudson et al., 2007).

The second aim is to examine whether a more interactive intervention can improve outcomes. Previous work has compared two internet interventions with identical content (Linardon et al. , 2022) but having interactive versus static format; drop out was reportedly higher in the latter than the former, but no significant differences were found between the two groups for adherence rates or symptom reduction. In the current study, the content, commitment time, and length are comparable between the two interventions while the delivery format (webpages versus PDF) varies significantly. Given the impact of more interactive formats on drop out which may impact clinical outcome, we predict better outcomes for the internet than the PDF version of CBT.

Methods

Ethics and trial registration

Approval was received from the Flinders University Humans Research Ethics Committee (project number 5918). This study was prospectively registered with the Australian New Zealand Clinical Trials Registry (trial registration number ACTRN12621001448831).

Interventions

Focused Minds Program **(FMP;** https://www.focusedmindsprogram.com/**)**

The self-guided internet program, *Focused Minds Program* (FMP), contained content adapted from the book *Overcoming Perfectionism: A self-help guide using Cognitive Behavioural Techniques* (Shafran, Egan, & Wade, 2010). It consists of eight modules (Table 1) designed to take 20 minutes each to complete, and includes multimedia content, downloadable worksheets, and psychoeducation.

Perfectionism modules created by the Centre for Clinical Interventions (CCI-P)

The CCI-P intervention (https://www.CCI-P.health.wa.gov.au/Resources/Looking-After-Yourself/Perfectionism) comprises nine modules; one was removed (*Reducing my Perfectionist Behaviour*) to ensure equal length of the intervention groups. Psychoeducation, worksheets, and suggested activities were included in a PDF format.

Participants

Participants were recruited through the global recruitment site Prolific. Participants completed an eligibility screener, read the participant information sheet, and provided online consent prior to receiving access to the baseline survey. Eligibility criteria was English fluency, aged 17-25 years old, reliable internet access, and current shape, weight, or eating concerns (scoring >46 on the 5-item Weight Concern Scale [Killen et al, 1993] which indicates significantly increased risk of developing an ED [Jacobi et al., 2011]). Exclusion criteria was currently engaged with treatment of an ED or ED concerns. Participants were reimbursed at a rate of £9GBP per hour (approximately £1.20 per survey), a total of $17AUD (£10GBP) across a 4-month period. Reimbursement was only given for survey completion to ensure equal pay for participants and to mitigate the risk of engagement bias.

Power Analysis

A priori power was calculated (Hedeker et al., 1999) using a two-sided test, alpha of 0.05, and a power level of 0.80. Estimated effect size of 0.40 and estimated attrition of 30% by end of treatment was chosen based on a previous RCT with similar methodology (Shu et al., 2019). A sample size of 55 participants per group (165 participants total) was required.

Procedure

Baseline measures and demographic information (ethnicity, country of residence, age, and gender) were collected prior to participant randomisation. Randomisation and data collection was conducted through the online survey platform Qualtrics. Participants who were randomised to an intervention group were emailed login details and recommended to complete two modules per week for the first four weeks. Participants were invited to complete weekly surveys for four weeks, a one-month follow-up, and a three-month follow-up. Following the three-month follow-up, all participants were provided access to the *Focused Minds Program*. Participants were only provided with technical support for the interventions or using Prolific, with no other support offered over the intervention.

Measures

Primary outcomes

The ED15 (Tatham et al., 2015) is a 15-item questionnaire assessing disordered eating over the last week. Ten items address weight and shape (e.g. *[I] felt distressed about my weight*) and eating concerns (e.g. *[I] worried about losing control over my eating*). Five items address ED behaviours (e.g., laxative use, restriction, bingeing). Internal consistency for the first 10 items was strong, Cronbach's alpha =.88.

Two subscales were chosen from the 35-item Frost Multidimensional Perfectionism Scale (FMPS; Frost et al., 1990), the Concern over Mistakes subscale (nine items) and the Personal Standards subscale (seven items). Internal consistency (Cronbach's alpha) in the current study was .89 and .83 for respectively.

Secondary outcomes

The 22-item Forms of Self-criticism/Self-reassurance scale (FSCRS; Gilbert et al., 2004) measures two forms of self-criticism (self-hatred and self-inadequacy) as well as self-reassurance (Gilbert et al., 2004). In the current study, Cronbach's alpha was 0.87, 0.92 and 0.93 respectively.

The 21-item Depression, Anxiety, and Stress Scale-Short Form (DASS-21; Lovibond & Lovibond, 1995) uses a 4-point Likert scale from 0 (*Did not apply to me at all*) to 3 (*Applied to me very much, or most of the time*). Higher scores indicate greater symptom severity. In this study Cronbach's alphas were high; .91 for depression, .83 for anxiety, and .86 for stress.

The 14-item Warwick-Edinburgh Mental Well-Being Scale (WEMWBS; Tennant et al., 2007) measures a single construct of mental wellbeing with items scored from 1 (*None of the time*) to 5 (*All of the time*). It has high test-retest reliability (0.83; Tennant et al., 2007). In the current study, Cronbach's alpha was 0.93.

The 6-item Credibility-Expectancy Questionnaire (CEQ; Devilly & Borkovec, 2000) loads on two factors; treatment credibility and expectancy of effectiveness of the therapy. Respective Cronbach's alphas were .87 and .73.

Data analysis

Logistic regression was used to determine whether any baseline variables predicted missingness across the longitudinal data. A binary variable was created to categorise participants who were not missing data and those missing at least one scored variable and entered as a dependent variable in the model and all baseline measures and age (Step 1) and gender (Step 2) were added as covariates.

For the CEQ, an independent samples t-test was performed comparing CCI-P and FMP groups at mid-point (week 2) and at end of treatment (week 4).

Intent to treat (ITT) analysis was conducted using all 172 randomised participants. Linear mixed models (LMMs) used an unstructured covariance structure, restricted maximum likelihood estimations to handle missing data, and Bonferroni adjustments to account for repeated measures. An assumption of LMM is that data are missing at random. Baseline dependent variables, group, time, and interactions between group and time were included as fixed effects, hence both between group effects and interactions were of interest to indicate significant differences between the groups. Estimated means and standard errors were used to calculate between-group Cohen's *d* using the online Campbell Collaboration tool).

Engagement data were analysed using data available from all survey responders in the CCI-P group (*n* = 54) and the FMP group (*n*= 40). Total number of modules completed was estimated from the question "How many modules have you completed to date?" . Weekly tallies were summed and divided by the number of survey responders to calculate an average number of modules completed across the 4-week treatment period. Average duration spent completing each module was estimated from the question "What percentage of the modules did you complete?". Module completion was averaged across the total number of corresponding responses for each intervention. Average percentage of each module attempted was addressed using 4 options to answer "How long did you spend completing each

module?"; Under 10 minutes. 10-20 minutes, 20-30 minutes, over 30 minutes. Calculating the average time per module was not feasible due to participants' categorical responses. Time spent per module was instead determined from the majority (mode) of responses.

Results

Participant flow and demographics

Online recruitment occurred over a three-day period (2nd-5th September 2022) across 21 countries. Of the 368 participants screened, 172 (46.7%) met the inclusion criteria and were randomised into the study. By end of treatment (week 4), attrition reached 36% for the FMP group, 33% for the CCI-P group, and 12% for the control group. See Figure 1 for CONSORT diagram of participant flow through the study. The sample population identified as female (50.6%), male (45.9%), and non-binary/other (2.3%), with a mean age of 22.6 years (*SD* 1.99). Average baseline ED-15 score was 3.61 (*SD* 1.09) for females and 2.99 (*SD* 1.06) for males, indicating elevated shape, weight, and eating concerns in this population compared to a community sample of 2.05 (*SD* 1.33) for females and 1.31 (*SD* 1.15) for males (Tatham et al, 2015). See Table 2 for participant description.

Missing data

Baseline variables were all non-significant in predicting missingness, indicating that the data was missing at random.

Intervention credibility

Average credibility scores did not significantly differ between the CCI-P and the FMP group at either mid-point; $t(77) = -0.08$, $p = .94$, or end of treatment; $t(69) = 0.61$, $p = .54$. A significant difference was observed in average expectancy scores whereby scores for the

FMP group were significantly higher than the CCI-P group at both mid-point; $t(47) = -7.96$, p <.001, and end of treatment; $t(59) = -2.74$, $p = .008$.

Comparisons between groups

The estimated means and SE for all groups across the time points is shown in Table 3. A main effect of time indicated that all groups experienced improvements in disordered eating and self-criticism scores. A main effect of group was found for disordered eating, perfectionism, self-criticism, depression, anxiety, and stress. A significant time by group interaction was found for personal standards and anxiety, where both intervention groups decreased more steeply than the control group over time (see Figures 2 and 3). The only outcome variable to show neither a significant main nor interaction effect was wellbeing.

Between group effect sizes

At the end of the intervention, the FMP intervention performed significantly better than the control condition for disordered eating, depression, stress, inadequacy, concern over mistakes, and personal standards (Table 4). In contrast, the CCI-P intervention only significantly outperformed the control condition on stress. The two active interventions did not perform significantly differently on any measure except the FMP showed a greater reduction in depressive symptoms than the CCI-P.

For the FMP intervention, effects were maintained at one-month follow-up for all variables except personal standards. Additionally, a significant difference in wellbeing was present between the FMP and control condition. For the CCI-P intervention, a greater number of significant effects were present at follow-up than at the end of treatment and it significantly outperformed the control condition for disordered eating, anxiety, inadequacy,

and the personal standards. No significant differences emerged between the two interventions at one-month follow-up.

At three-month follow-up, significant effects were maintained between the FMP and control condition for eating, depression, anxiety, stress, inadequacy, self-hatred, and concern over mistakes. For the CCI-P, significant effects were maintained for eating, stress, and inadequate self. FMP outperformed CCI-P for self-hatred.

Post-hoc analysis

A post-hoc analysis was conducted for the CCI-P intervention group to examine a potential mediation pathway for the reduction in disordered eating symptoms seen at 3-month follow-up, despite the lack of significant change in perfectionism in this group. Simple linear regression was conducted on all three possible predictors; variables which showed a significant change between the CCI-P and control group at 1-month follow-up. Regression analyses were conducted for inadequacy, anxiety, and personal standards. None of the variables significantly predicted disordered eating at 3-month follow-up, however, inadequacy approached significance (see Table 5).

User engagement

By the end of the 4-week treatment period, two participants had completed all eight modules in the FMP group (an average of 4 modules) and one participant had completed 7 of the 8 modules in the CCI-P group (an average of 3.6 modules). No participants completed all modules of the CCI-P intervention. Completion rates were not significantly different between the two interventions. Both intervention groups reported completing an average of 75% of the modules they attempted. Rates of study drop-out were significantly lower for the control group than either intervention group. At end of treatment, retention rates were 88% for the

control condition, 64% for the FMP intervention, and 67% for the CCI-P intervention. At three-month follow-up, retention was comparable between the FMP (64%) and CCI-P (65%) but decreased to 75% for the control condition.

Discussion

The aim of this RCT was to determine the efficacy of an internet self-guided perfectionism intervention targeting young adults considered at-risk of developing an ED (an early intervention approach). The level of disordered eating in this population was considerably higher than the nonclinical average (Tatham et al., 2015). Levels of restriction ($M = 3.27$, $SD = 3.39$) were double that of the reported average in a nonclinical population ($M = 1.59$, $SD = 1.44$). The rationale for the study was informed by the high association between perfectionism and disordered eating (Bills et al., 2023; Limburg et al., 2017; Stackpole et al., 2023). This RCT was novel in its design by comparing two self-guided perfectionism interventions.

Both active interventions significantly decreased disordered eating over follow-up, with no differences between the two. The pattern of influence between the two, however, was different. At end of treatment, the FMP intervention outperformed the waitlist control condition by showing a significant reduction in ED symptoms, depression, stress, inadequacy, and perfectionism. This pattern was essentially maintained over follow-up. In the three-month follow-up the FMP managed to maintain significant improvements in six of the ten outcome measures, including perfectionism and ED symptoms. The CCI-P intervention, in contrast, had more significant effects compared to waitlist control at follow-up than at end of treatment, suggesting a delayed effect of the treatment. The CCI-P impacted fewer secondary outcomes than waitlist control, with significant improvements on four outcomes at

one-month follow-up and on three at three-month follow-up. Despite showing significant reductions in disordered eating, the CCI-P showed a reduction in only one perfectionism subscale at one-month follow-up and no significant change at three-month follow-up compared to waitlist control. This finding would suggest that the CCI-P intervention may have impacted ED symptoms by means other than reducing perfectionism, perhaps through a reduction in self-criticism or negative affect at follow-up. Three possible mediation pathways were identified in post-hoc analyses yet no significant predictors emerged. Despite this lack of definitive predictors, inadequacy (self-criticism) approached significance which gives cause for a more robust investigation into mediational pathways in the future. Previous literature suggests self-criticism largely accounts for the relationship between perfectionism and disordered eating symptoms (Dunkley et al., 2006). We note that the FMP group also saw a significant reduction in inadequacy at both end of treatment and one-month follow-up.

Adherence and engagement were well-matched between the CCI-P and FMP. Respectively, 27.5% and 28% of participants never accessed a module. The lack of difference between intervention usage confers with previous findings (Linardon 2022) that using an interactive format does not impact intervention uptake or adherence. Study retention was also comparable between the FMP and CCI-P (64% and 65% at 3 month follow up, respectively) whilst retention was considerably higher for the control condition (75% at three-month follow-up). This latter finding is typical of such groups given they gain access to the intervention after data collection. Attrition rates were comparable with previous investigations of online interventions for perfectionism (Kothari et al., 2019; Shu et al., 2019). The matched ratings of adherence, engagement, and credibility suggests that acceptability of the two interventions is similar.

Strengths

343

The ability to conduct recruitment online meant a diverse participant sample was obtained (a high male to female ratio collected from over 18 countries with over half (52%) identified as non-Caucasian), permitting some generalisation of our findings.

By addressing a transdiagnostic factor, we show clinical utility across multiple mental health concerns that are impacted by perfectionism. This approach, plus its easy dissemination via the internet, makes it an ideal first point of contact for individuals wishing to improve their mental wellbeing without requiring them to seek professional help. Individuals at risk for developing an ED may be more accepting of a transdiagnostic, more generic, approach than having to acknowledge and accept help for disordered eating, resulting in earlier intervention.

Limitations

Whilst the current study was able to draw robust conclusions about the efficacy of the FMP, it still leaves several unanswered questions about what benefits, if any, are unique to the internet interactive format. A more sophisticated web design is needed to best utilise the components that could lead to higher adherence, lower drop out, and improved treatment outcome. While these findings showed very few significant differences between the two active interventions, the current study may be underpowered to detect significant differences between the two. While results suggest that the FMP intervention contributed to more widespread beneficial outcomes than the CCI-P, the current data provides no evidence why this occurred. Future trials may consider asking participants for feedback on the aesthetics, comprehensiveness, usability, and real-world applicability of their programs to discern what factors contribute to an intervention's success. The generalisability of these findings may also be limited as we are unable to determine the true nature of participants' motivation to be in the study. It is plausible that the compensation rate of approximately £9GBP/hour influenced

participant's decision to partake in this program, rather than a genuine desire to change their perfectionism. Similarly, whilst the eligibility criteria helped to identify and exclude participants who are actively engaged in eating disorder treatment, no screening measure was applied to diagnose potential participants who would meet an ED diagnosis if appropriately assessed. Whilst this study aimed to address early intervention in young adults who experience sub-clinical levels of disordered eating, the findings of this study cannot be purely related to this population as some potential overlap with clinical cases may have occurred.

Future implications

Accessing treatment for an ED faces some unique barriers which impede treatment engagement. Providing internet treatment for a transdiagnostic issue such as perfectionism may form part of the solution to the treatment gap. The self-guided nature of the intervention makes it possible to be offered as a preliminary, adjunct, or exit strategy to face-to-face therapy. Other considerations for future trials include investigating and identifying moderators of outcome that may help us understand where internet interventions should sit in the stepped-care approach, for whom internet interventions are predicted to be most efficacious, and what are the predictors of poor response that will likely warrant more intensive treatment options.

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Appendix C: Published Study Three

Accepted manuscript referenced in **Chapter Two**, **Seven**, and **Nine.**

This is the peer reviewed version of the following article:

Robinson, K., Atkinson, M. J., Kylišová, K., Egan, S. J., Shafran, R., & Wade, T. D. (2024). Pilot implementation of an evidence-based online cognitive behavioural therapy for perfectionism in university students: Lessons learnt. *Stress and Health*, e3444. https://doi.org/10.1002/smi.3444, which has been published in final form at

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Pilot implementation of an evidence-based online cognitive behavioural therapy for perfectionism in university students: Lessons learned.

Running Title: Perfectionism trial in university students

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Abstract

Higher Education Institutes (HEIs) have been met with an unprecedented demand on their student counselling and wellbeing services in recent years with the impacts of COVID-19 and high rates of mental health concerns amongst student populations. Online mental health programs offer one solution by providing students with quick and easy access to effective therapeutic content. The Focused Minds Program (FMP) is an evidence-based eight-module online self-guided cognitive behavioural intervention that targets the transdiagnostic risk factor of perfectionism and has been shown to decrease depression, anxiety, and disordered eating. The program was implemented at a UK university between 2021-2023. Recruitment occurred via departmental emails, academic staff, and the university's counselling staff and website. Participants were provided with access to the intervention for six-weeks and completed weekly surveys of psychosocial measures. The trial's implementation was assessed using the RE-AIM framework: reach (uptake via the recruitment channels), effectiveness (outcomes on psychometric measures of mental wellbeing), adoption (staff and organisational support), implementation (intervention engagement and attrition), and maintenance (continued implementation across the trial period). Key barriers to successful implementation, as well as proposed solutions, are discussed to guide future online mental health interventions provided in HEIs.

Introduction

Timely access to effective mental health support is a growing issue amongst higher education institutions (HEIs). Young adults (24 years old or younger) make up 90% of undergraduate enrolments at HEIs, an age when most mental illnesses first present e.g., 18-25 years (Thorley, 2017). Globally, life satisfaction has been shown to decline most rapidly between the ages of 15-24 years old with anxiety and depression being the most reported mental health concerns (Handa et al., 2023; Neves & Hewitt, 2020; Thorley, 2017).

Undergraduate students are reported to have lower levels of wellbeing than the general population for age matched peers (Thorley, 2017). Students face considerable academic, financial, and social demands whilst at university often within the context of moving away from regular social supports and living independently for the first time. Students take on greater responsibility to manage their workload, self-direct learning, and adapt to their new environments. The inability to successfully manage these transitions to higher education can significantly impact mental wellbeing and academic prospects. Poor mental health in students is associated with increased risk of academic failure, lower GPA, withdrawal from university, and suicide (Bruffaerts et al., 2018; Thorley, 2017; Zając et al., 2023).

Mental health issues have been exacerbated by COVID-19, with young adults being disproportionately affected by the pandemic (Mental Health Foundation, 2020; OECD, 2021). The prevalence of depression and anxiety surged dramatically during the pandemic, with rates being 30-80% higher amongst young adults than in the general population (OECD, 2021). Similarly, a global increase in the prevalence of eating disorders (ED) and worsening of ED symptoms was observed in young adults during the COVID-19 pandemic (Gao et al., 2022; Geddes et al., 2022; McLean et al., 2022; Zipfel et al., 2022). Perfectionism is both a

risk and maintenance factor for depression, anxiety, EDs (e.g, Anorexia Nervosa, Bulimia Nervosa) and disordered eating behaviours (e.g., body dissatisfaction, dietary restraint, drive for thinness; Cooper & Shafran, 2008; Limburg et al., 2017). Most UK students (58%) surveyed in 2020 by the Higher Education Policy Institute indicated their mental health had worsened as a result of COVID-19 (Tinsley, 2020). Conversely, less than half (42%) of students reported feeling satisfied with the way their HEI delivered mental health services in 2020, during the height of the pandemic (HEPI Policy Note 27, 2020).

Flett and Hewitt (2020) argue that impact of COVID-19 was especially challenging for those with elevated perfectionism given the uncertainty of the pandemic would violate their need for control and limit their ability to engage in goal-directed behaviours. They suggest that people with high levels of perfectionism may be more reactive to stress and unable to cope with change due to rigid and inflexible thinking patterns. Trends indicate students are experiencing higher levels of perfectionism than previous generations. A meta-analysis by Curran and Hill (2019) demonstrates an increase in various perfectionistic constructs in 41,641 college students from America, Canada, and Britain over a 27-year span. The rise in perfectionism in college students has negatively impacted psychological wellbeing, depression, anxiety, suicidal ideation, and academic performance within this cohort (Çapan, 2010; Curran & Hill, 2019; Fernández-García et al., 2023; Flett & Hewitt, 2002; Osenk et al., 2020). Despite these recent trends in perfectionism and mental health difficulties, it is estimated that 20-30% of students with a mental health concern currently access university counselling or wellbeing services (*Student Minds*, 2023).

A study by Remskar et al. (2022) conducted in the UK identified key barriers and guidelines for improving student engagement with wellbeing services on campus. Students highlighted the need for an inclusive service that offers prevention and low-intensity (brief

and without formal referral) wellbeing support, rather than feeling the need to reach a threshold for acute or severe mental health issues before seeking access. Students also expressed dissatisfaction with the level of applicability of the skills offered and their relevance to daily living. Students expressed preferences for wellbeing support to be offered widely and early in the academic year, that services offer support as prevention rather than intervention-focused, and that skills are easily applicable to day-to-day activities. Students indicated they would engage with wellbeing support if practical barriers were minimal and support options were readily accessible and well-advertised. To achieve these recommendations, a greater range of programs are needed to address the treatment gap for university students. The delivery of face-to-face counselling is resource intensive and may not be suitable for all students given the range of barriers to help seeking. Online programs offer low-intensity options that can be tailored towards improving and maintaining wellbeing. Such options would address several of the main concerns raised by Remskar et al. (2022) suggesting that students wish for improved accessibility and to access wellbeing interventions outside of periods of acute mental distress.

A modified version of the online Focused Minds Program (FMP; www.focusedmindsprogram.com) was offered to students at a HEI in the UK to assess the feasibility of an online low-intensity wellbeing intervention. Efficacy of the FMP has been evaluated previously as part of a three-armed randomised control trial (RCT; Robinson et al., 2023), a program that was informed by numerous previous RCTs showing online cognitive behaviour therapy (CBT) interventions for perfectionism to decrease perfectionism, depression, anxiety, and disordered eating (Galloway et al., 2022; Robinson & Wade, 2021). The FMP has not, however, yet been tested for real-world dissemination and the impact on university students is unknown. Feasibility and effectiveness need to be demonstrated in real-

world implementation. To this end this study examines the success of implementation of the online intervention for students at a UK HEI.

Implementation outcomes for this trial were assessed according to the Reach, Effectiveness, Adoption, Implementation, and Maintenance (RE-AIM) framework (Glasgow et al., 1999). The RE-AIM framework is an evaluation tool designed to assess the external validity of an intervention through adoption, implementation, and sustainability, in turn providing feedback on program engagement and effectiveness. The RE-AIM model helps to answer the question of who the intervention is most likely to reach, how the program may realistically be implemented, what is the real-world effectiveness, and for what cost (Holtrop et al., 2018). By evaluating its use, the RE-AIM model helps to direct future program usage and to improve on the implementation methods. By using a mixed-methods approach, the RE-AIM framework provides an understanding of the real-world impact of a program beyond its effect on standard outcome measures.

In the current study, implementation was assessed against the five categories of the RE-AIM model. Reach was assessed via the number of referral pathways, uptake via each pathway, the representativeness of the sample population against the total student population, and qualitative feedback on the program's promotion. Effectiveness was assessed using psychological outcome measures from baseline, end of treatment, and one-month follow-up. Adoption was assessed at an organisational level by the number of staff involved in the project, the number of departments that agreed for students to be contacted about recruitment, and qualitative feedback about staff support from the program. Implementation and barriers to implementation were examined by rates of attrition, program engagement, and qualitative feedback about program engagement. Maintenance assessed the sustainability and barriers to sustainability across the trial's duration. This evaluation recognised that the intervention must

be adopted at an individual and organisational level to influence the intended audience; weakness in either factor can prevent successful implementation. Feedback from this pilot project will provide recommendations and adaptations to guide future iterations of the FMP and other digital interventions.

Methods

Setting

The University of Bath (UoB) is a public research university situated in Bath, England. At the time of this study (2021), the UoB had 15,783 domestic students and 4,143 international students. The UoB has 20 departments organised under four faculties: Humanities and Social Sciences, Engineering and Design, Science, and School of Management. The UoB provides students with academic and non-academic support via Student Services which includes wellbeing, disability, financial, international, and counselling services.

Design

This study employed a mixed methods design. The purpose of the qualitative assessment was to investigate students' experiences and perceived acceptability of the FMP (e.g., relevance, perceived effectiveness, and practical likes and dislikes). Information from the qualitative investigation has been included to provide context and content in the RE-AIM model. The purpose of the quantitative assessment was to investigate the efficacy and engagement of the FMP during its implementation at the UoB.

Student participants

Participation was open to all students aged 17 and over (including part-time, international, and postgraduate students). No eligibility criteria were applied to allow for maximum student uptake of the program and to allow all students who self-identify with any perfectionistic traits to access the intervention. Recruitment was scheduled to commence at the beginning of the academic year (October 2021) and to continue for as long as study recruitment was feasible. No recruitment target was chosen to allow for organic uptake of the intervention to be assessed.

Intervention

The proposed intervention was a self-guided online program with content adapted from the book *Overcoming Perfectionism: A self-help guide using Cognitive Behavioural Techniques* by Shafran, Egan, and Wade (2010). The program, titled the *Focused Minds Program* (FMP), consisted of eight modules designed to take 20 minutes each to complete. Each module included videos, interactive content, downloadable worksheets, and psychoeducation on an aspect of perfectionism. The FMP was made available online to students via the virtual learning environment Moodle, which contained introductory material, instructions, and links to all modules. The modules themselves were constructed using online toolkit Xerte. The FMP was adapted with support from the university's Technology Enhanced Learning team and was replicated from the original website (www.focusedmindsprogram.com). The content of the FMP is summarised in the Supplementary Material. Program content remained faithful to original with alterations made to the formatting, interface, and introductory page for each module. The FMP was offered as an unguided self-help intervention with technical support provided on demand.

Qualitative feedback

357

Qualitative data collection, coding, and analysis was performed between 2021-2022 by a UoB master's degree student (KK) whose area of research focused on perfectionism. Individual semi-structured interviews were conducted July-August 2021 and a focus group was conducted in March 2022. A purposive sample of eleven students were recruited to provide qualitative feedback on the FMP via individual interviews (five females and two males) or a focus group (three females and one male). Student ages ranged from 18-28 years old, with one mature student being over 40 years of age. Participants were a combination of undergraduate and postgraduate students from the disciplines of psychology, chemical engineering, education, economics, and international management. Invitations to participate in an interview were distributed via email by a member of the student services wellbeing team. Individual invitations to participate in the focus group were distributed via email by a master's student (KK). All qualitative interviews and the focus group took place via Microsoft Teams (MT). The researcher involved in conducting the qualitative sessions had no prior relationship with any of the participants. The duration of individual interviews ranged from 30-60 minutes and the focus group was 1 hour 10 minutes. All participants completed a minimum of two modules prior to providing feedback. Session recordings were manually transcribed and checked for accuracy by KK. All qualitative feedback was analysed using reflexive thematic analysis (Braun and Clarke, 2006). Data was coded using a primarily inductive approach to allow in-depth understanding of students' experience and views of using the FMP. An example of coding extract is provided in the Supplementary Figure. Initial codes, themes, and subthemes were generated using an iterative process to develop coherent and heterogenous concepts regarding the FMPs strength, limitations, and suggested improvements. Consultation on the list of themes and subthemes was provided by the UK lead investigator prior to producing the final thematic analysis.

Measures

Perfectionism

Two subscales, personal standards (PS; seven items) and concerns over mistakes (CM; nine items), were chosen from the Frost Multidimensional Perfectionism Scale (FMPS; Frost et al., 1990) to measure perfectionism. These two subscales were chosen due to their self-oriented focus and established association with disordered eating behaviours (Stackpole et al., 2023). Cronbach's alpha was 0.84 for CM and 0.78 for PS in the current, indicating acceptable internal consistency. The FMPS has been indicated to have some predictive validity for differentiating between samples with or without ED symptomology. Franco et al. (2014) found significantly higher scores on the FMPS total score and CM subscale in women with ED symptoms than in a healthy control group (t= 3.14, p<.001). Moderate correlations have been found between the CM subscale and The Eating Attitudes Test--26 (r = .43, p <.01; Garner et al., 1982,) and the Eating Disorders Inventory (r_s =.46-.59, p<.01; (Frost et al., 1990; Minarik & Ahrens, 1996).

Weight concern and disordered eating

The Weight Concern Scale (WCS) is a five-item questionnaire measuring weight and shape concerns in women. Higher scores are indicative of subsequent eating disorder development over a 4-year period (Jacobi et al., 2011; Killen et al., 1996). Wording of the WCS was changed to make the items gender non-specific (e.g., "*I worry a lot less than other women*" was changed to "*I worry a lot less than other people*"). The WCS shown to have an excellent ability to predict the onset of eating disorders in adolescent girls over a three-year (Killen et al., 1994) and four-year (Killen et al., 1996) period. Girls who scored in the top quartile of the WCS had a 10-12% incidence rate for developing an eating disorder, compared with girls who scored in the lowest quartile having a 0-2% incidence rate (Killen et al., 1996; Killen et al., 1994). Correlational analysis indicated adequate concurrent validity

with Body Shape Questionnaire ($r = 0.95$, $p < 0.001$; Silva et al., 2017), which is also a measure of body shape concern, and the Sick Control One Fat Food ($r= 0.56$-0.61, $p < .001$; Brasil et al., 2023), a measure of eating disorder symptomology. Internal consistency (Cronbach's alpha) of the WCS was 0.77 for the current study.

The Eating Disorder-15 (ED15; Tatham, 2015) is a positively worded 15 item questionnaire that assesses weight and shape concerns and cognitive concerns (ten items) and behaviours (five items) relating to disordered eating over the previous week; objective binge episodes, restriction, self-induced vomiting, laxative use, and driven exercise. The questionnaire can be scored to create an Overall Attitudinal score (first ten items) and the Cronbach's alpha in the current study was 0.92, indicating strong internal consistency. Concurrent validity of the ED-15 has been assessed with comparison to the Eating Disorder Examination Questionnaire (EDE-Q), which is a gold standard self-report measure assessing ED cognitions and behaviours over the past 28 days. Overall score and both dimensions of the ED have been found to be moderately to highly correlated with all four dimensions of the EDE-Q ($r_s = .55$ - $.89$; Tatham et al., 2015). The ED-15 also has good discriminant validity by showing a strong negative association with body appreciation (Body Appreciation Scale II, $r = $ -.76; Compte et al., 2022).

Self-criticism

The Forms of Self-criticism/Self-reassurance scale (FSCRS; Gilbert et al., 2004) is a 22-item questionnaire which assess negative and self-critical thoughts and feelings. The FSCRS consists of three subscales: self-hatred, self-reassurance, and self-adequacy with Cronbach's alphas of 0.81, 0.85, and 0.85 respectively in the current study. The FSCRS has been compared against the Levels of Self-Criticism scale (LOSC; Thompson & Zuroff, 2000), which measures the two factors of comparative self-criticism and internalised self-criticism. Previous studies have indicated the FSCRS to have acceptable convergent validity

through moderate to high correlations with measures of self-compassion (self-inadequacy =-.70- -.63, self-hatred = -.68- -.53, self-reassurance = .56- .82), depression (self-inadequacy = .55-.64, self-hatred = .49-.66, self-reassurance = -.66- -.40), and life satisfaction (self-inadequacy = -.57, self-hatred = -.54, self-reassurance =.62; Biermann et al., 2021; Castilho et al., 2015; Kupeli et al., 2013).

Wellbeing

The Warwick-Edinburgh Mental Well-Being Scale (WEMWBS; Tennant et al., 2007) is a 14-item measure for the single construct of general mental wellbeing. Good criterion validity has been demonstrated between the WEMWBS and other well-being scales. The WEMWBS showed a moderate ($r = 0.43$, $p <.01$; Tennant et al., 2007) to high ($r = 0.72$, $p < .001$; Sarasjärvi et al., 2023) association with the overall health (EuroQol Health Status Visual Analogue Scale), a high correlation ($r = 0.73$, $p <.01$; Tennant et al., 2007) with life satisfaction (Satisfaction with Life Scale), and a moderate ($r = -0.53$, $p <.01$; Tennant et al., 2007) to high ($r = -0.76$, $p <.001$; Sarasjärvi et al., 2023) negative association with mental illness (General Health Questionnaire). Cronbach's alpha of the WEMWMBS in the current study was 0.91, suggesting strong internal consistency.

Credibility and expectancy

The Credibility-Expectancy Questionnaire (CEQ; Devilly & Borkovec, 2000) is a six-item questionnaire assessing intervention expectations and perceived credibility. Expectancy scores have been demonstrated to have some ability to predict treatment outcome for depression ($r = −0.50$, $p < .05$), subjective distress ($r = 0.65$), and general distress ($r = 0.74$; Devilly & Borkovec, 2000). Cronbach's alpha in the current study was 0.73 for the credibility subscale and 0.87 for the expectancy subscale.

Mood

The Depression, Anxiety, and Stress Scale- Short Form (DASS-21; Lovibond & Lovibond, 1995) is a 21-item questionnaire assessing depression (Cronbach's alpha = 0.88), anxiety (Cronbach's alpha = 0.84), and stress (Cronbach's alpha = 0.79). Convergent validity for the DASS-21 has been assessed against the Positive and Negative Affect Schedule (PANAS; Watson et al., 1998), Beck Depression Inventory II (BDI-II; Beck et al., 1996), and the Beck Anxiety Inventory (BAI; Beck et al., 1998). Findings indicate the DASS-21 to be strongly correlated with negative affect ($r = 0.69$- .77, $p <.01$), and negatively correlated with positive affect ($r = -.37 - -.24$, $p <.01$; Henry & Crawford, 2005; Gloster et al., 2008). The composite DASS-21 scale strongly correlates with depressive symptoms (BDI-II; $r = .75$-.80, $p < .001$) and anxiety symptoms (BAI; $r = .69$-.71, $p < .001$; Osman et al., 2012; Gloster et al., 2008).

Engagement

Program engagement metrics were captured using a Sharable Content Object Reference Model (SCORM) package embedded within each module link on the Moodle platform. Engagement metrics included number of participant logins, modules accessed during login, and duration of each access. A third-party software engineer assisted with calculating the metrics provided. A series of queries were created and executed using the Python programming language. The queries excluded outliers and invalid records with negative time stamps.

Procedure

Ethics approval was received from the Psychology Research Ethics Committee (PREC) which functions as a sub-committee of the Academic Ethics and Integrity Committee

at the University of Bath (Ethics application number 21-211). This study was not prospectively registered. Participation was offered to student within selected departments via departmental emails. Participation was offered first to departments the researchers had direct contact with. Email distribution was contingent upon Head of Department approval in each instance. Other recruitment pathways included personal tutors, student services, and a student services' self-help resources webpage. Staff at student services were able to direct individual students to the program when relevant concerns were evident. All students were asked to indicate how they heard about the program to evaluate effective recruitment routes.

Interested students were directed via their recruitment pathway to a Qualtrics survey. The survey provided students with a participant information sheet and consent form. Consenting participants were asked to provide a contact name and university email address, referral pathway, reason for registering, demographics (i.e., age, gender, ethnicity, department, degree course, year level), and baseline self-report measures. Participants were manually enrolled into the FMP and provided with access for a six-week period. All modules were accessible after first enrolment and participants were recommended to complete two modules per week for four weeks.

Participants were asked to complete weekly self-report measures via emailed survey links for the duration of their study enrolment and were also emailed a one-month follow-up survey. All surveys required approximately 10 minutes to complete. All surveys provided a contact email address if participants wished to ask further questions.

Statistical Analysis

The quantitative evaluation of psychological measures and program engagement was performed by KR at Flinders University. All data was provided for analysis at the cessation of the study.

Missingness

Due to the significant proportion of missing data, logistic regression was used to determine whether data was missing at random or not. Missingness was categorised using a binary variable with >10% of data missing categorised as *Missing*, <10% data missing categorised as *Complete*. A logistic regression model was then applied to determine whether age, gender, or any baseline outcome measures were predictive of data being categorised as *Missing* or *Complete*. Hosmer and Lemeshow's test determined goodness of model fit.

ITT analysis

Intent to treat analysis was conducted using linear mixed models (IBM SPSS Statistics, Version 27) to account for the high proportion of missing data. LMMs were performed for all outcome measures using restricted maximum likelihood estimations, an unstructured covariance structure, and Bonferroni adjustments. An online effect sizes calculator (https://www.psychometrica.de/effect_size.html#repeated) for repeated measures was used to calculate within-group Cohen's *d* based on estimated means and standard deviations. Pooled standard deviations were used to control for the intercorrelation of both groups (Lakens, 2013). Correlations between pre- and post-test scores were obtained using completers data.

Completer analysis

Completers analysis was conducted using paired samples *t* tests (IBM SPSS Statistics, Version 27) using only data from participants who completed baseline and end of treatment or follow-up measures. Within-group effect size estimates (Cohen's *d*) were calculated using the standard deviation of the mean difference adjusted by the correlation between measures.

Framework

The RE-AIM framework was evaluated using a combination of debriefing with the UK lead investigator, a staff member of UoB's student services, analysis of quantitative outcome measures, and qualitative data collected from focus groups and interviews. Each dimension of the RE-AIM framework was assessed according to the information available.

Data Storage

All data stored at the UoB was managed according to the Data Protection Act (https://www.bath.ac.uk/corporate-information/data-protection-act/). A de-identified version of the data was provided for quantitative analysis to the author (KR). All de-identified data was password protected and stored on a secure cloud server at Flinders University.

Results

Reach

Participant recruitment occurred over a 15-month period, between November 2021 and February 2023, during which 173 students enrolled in the intervention. The recruitment pathways were: emails from heads of department or the UK lead researcher (MA) to two of the faculties, staff from student services, in a lecture, other students, academic staff, or from the student services self-help webpage. The recruitment strategy that resulted in the most enrolments was emails sent to students (78% of our total sample). Emails were sent to 7806 students (5029 undergraduate, 2777 postgraduate) and 158 students accessed the baseline survey with 103 enrolling in the study, representing an uptake of 1.32% from students who received an email.

The recruitment strategy that resulted in the second highest number of enrolments was contact with student services. A total of 4,575 students were seen by student services' wellbeing team for a therapeutic session between November 2021 and February 2023. No data is available as to how many students were invited to access the FMP during this time. Of the 173 participants enrolled in the program, 14 (8% of the total sample) reported being referred through student services. This represents an uptake of 0.3% from all students presenting for a service. Of the potentially eligible student population, uptake of the FMP was 0.87%.

According to the University of Bath's Academic Registry, the university population consisted of 19,926 students in December 2021 (See Table 1 for demographic information). The study sample and university population were well matched for ethnicity and level of study, with oversampling occurring for students aged over 21 years (59% in the study sample compared to 2% in the undergraduate population), females (68.2% in study sample vs 45% in university population) and students from the faculty of humanities and social sciences (67.6% in study sample vs 33% in university population). Oversampling may be partially explained by targeted recruitment within the faculty of humanities and social sciences which has a majority female population. Perfectionism (concern over mistakes) scores were compared with an Australian university sample of 6,449 students to evaluate representativeness of this study's sample against a comparative demographic (Stallman & Hurst, 2011). Concern over mistakes (CM) scores were significantly higher for the UoB's study sample ($M = 29.03$, $SD = 5.66$) than the average score amongst Australian university students ($M = 19.46$, $SD = 7.35$), $t(6620) = 16.98$, $p < .001$ (scores adjusted for comparison with the briefer version; FMPS-29; Stallman & Hurst, 2011). At baseline, elevated levels of perfectionism were found amongst the student population for both concern over mistakes and personal standards (Stallman & Hurst, 2011; Stöber, 1998) indicating the intervention was reaching students who are affected

by perfectionism. Average weight concern was below the estimated cutoff score of 47 used to predict the development a subsequent eating disorder (Jacobi et al., 2011; Killen et al., 1996). Baseline depression and stress scores were in the moderate range and anxiety was in the mild range (Lovibond & Lovibond, 1995).

Qualitative feedback for reach

Initially the program was intended to be launched in October 2021 to coincide with the start of the new academic year. However, due to delays in website development and conflicts with the launching of other new year university initiatives, the FMP was launched in November 2021, approximately a month into the academic year. This suboptimal timing was highlighted by participants in the qualitative feedback provided during the focus group and individual interviews. The lack of context in which the FMP was launched was identified as an issue which likely impacted the perceived relevance of the program. The transitional period to starting university was identified as a period of high stress where access to the FMP would have been most beneficial. Similarly, having the program promoted via email left students unclear as to how the program was relevant within the university setting. Students expressed a preference for the program to be promoted by other students, student ambassadors, or peer mentors rather than by academic staff or wellbeing services.

'If it came from my personal tutor or the well-being services, I would not take it too seriously. But if it came from an actual student, a peer mentor or student living ambassador, that I would take a lot more seriously, […] they were in my shoes so they could relate and give me better advice.' -Individual interview participant

In the focus group perceived stigma around accessing support for mental health (including accessing student services) was also suggested as a barrier to engagement. In terms of the broader context of when the intervention was offered, suggestions from staff were that

367

the COVID-19 pandemic led to a saturation of online learning content for students in the UK. The high volume of online research and digital courses during 2021 may have lessened the appeal of the FMP following students' return to face-to-face learning. Feedback from the focus group indicated that students desired a social element to the program, such as an in-person meeting group or workshop.

Effectiveness

Intent to treat analyses

A main effect of time was found for disordered eating (ED15), perfectionism (both FMPS subscales) and intervention credibility (CEQ-C). See Table 3 for estimated means and standard errors at end of treatment (EoT) and follow-up. Significant within group effect sizes (Cohen's *d*) were found for every outcome measure at both EoT and follow-up. At EoT, small to moderate effect sizes (*d* =0.2-0.7) were found for personal standards (perfectionism), depression, anxiety, stress, reassurance, self-hatred, general mental wellbeing, and intervention credibility and expectancy. Large effect sizes (≥0.8) at EoT were found for disordered eating, concern over mistakes (perfectionism), inadequacy, and weight concern. At follow-up, small to moderate effect sizes (*d* =0.2-0.7) were found for personal standards (perfectionism) and intervention credibility and expectancy. Large effect sizes (≥0.8) at follow-up were found for disordered eating, concerns over mistakes (perfectionism), depression, anxiety, stress, inadequacy, reassurance, self-hatred, weight concern, and general mental wellbeing.

Completer analysis

As shown in Table 4, a significant reduction in scores between baseline and end of treatment were found for disordered eating (ED15), weight and shape concern (WCS),

perfectionism (both FMPS subscales), inadequacy (FSCRS), and treatment credibility (CEQ-C). A significant reduction in scores between baseline and follow-up were found for perfectionism (concern over mistakes) and inadequacy (FSCRS). A significant increase general mental wellbeing (WEMWBS) was found between baseline and follow-up. By the end of follow-up, 98% of participants were missing >10% of their dataset. No demographic variables or baseline outcome measures were predictive of data being *Missing* or *Complete*.

Qualitative feedback for effectiveness

Positive feedback from participants who had completed the intervention included: ability to recognise cognitive and behavioural patterns associated with perfectionism, ability to identify personal perfectionistic traits, awareness of the negative impact of perfectionism, challenging beliefs that perfectionism is normal and socially desirable, and understanding that perfectionism exists outside of academia. There was a consensus among participants that perfectionism is necessary for achievement in university students and accessing the FMP was the first instance of questioning this notion.

> *'A lot of time, it's very much promoted like oh, you should be perfect.[…] When people say you are a perfectionist, they don't think it's a problem. ' -Focus group participant*

Adoption

The program received initial support from the Deputy Director of student services, three staff members from the university's Technology Enhanced Learning team, two project managers from student services, and two members of academic staff from the Department of Psychology. Of the 60 staff members involved with Student Services, approximately 20 had direct contact with students and were actively referring to the program. No issues were reported with staff engagement in promoting the program. Advocacy from the Deputy

Director of student services played a significant role in the level of support and promotion the program received. Due to staff turnover, three Deputy Directors were involved during the FMP's trial period. Initial support for the program was strong during the planning stage (2020-2021). However, subsequent support was more conservative after the departure of the first Deputy Director and the program was limited to a proof-of-concept trial by mid-2021 with future implementation being contingent on the program's initial reception. Consequently, only two (Humanities & Social Sciences, and Engineering & Design) of the four faculties were approached via email to participate in the program. Of the 10 departments contacted, seven agreed to their students receiving a recruitment email. Only three departments (Psychology, Education, and Politics and International Studies) agreed to a second round of recruitment emails in December 2021.

Data gathered from the lead investigator (UK) suggests the loss in FMP support may have resulted from limited communication between organisational leads in student services about the nature and purpose of the program. Information about the FMP was not included in the handover to the current Deputy Director (March 2022-onwards) who was unaware of the program and that perfectionism had previously been identified as a primary concern for students accessing student services. Subsequently, by February 2022 the FMP was no longer being actively promoted by student services and access was only available via the student services self-help webpage.

Implementation

Intervention delivery was consistent across all participants, given the online nature of the program. However, attrition during the program reduced intervention fidelity and the ability of the intervention to effect change. All participants were provided with access to the FMP for a six-week period. A total of 108 participants accessed the intervention with 37.5%

never engaging with the website. Of the total number of enrolled participants, 18 (10.4%) received a full dose of the intervention and completed all eight modules. The highest percentage (21%) of active participants accessed only one module during their enrolment. See Table 5 for engagement data. Between baseline (n = 173) and end of treatment (n = 19) study attrition reached 89%. Of those that accessed the program, participants completed an average of 3.79 modules and spent a median time of 20 minutes on each module.

Qualitative feedback for implementation

Barriers to implementation mentioned during focus group were conflicting commitments (e.g., regular academic activities and exams) and activities which do not focus on academic success being a low priority.

'I feel like during the year, people are busy with exams and revision. They'd be like – I don't know what's the point of doing this, I'm not getting anything out of this apart from my personal benefit.' -Focus group participant

Positive feedback from the focus group indicated that students found the content engaging, the self-reflections activities were highly valued, and students enjoyed the interactivity of the website.

'It's really quite interesting, engaging. I also like the design where sometimes we have to […] really apply it to ourselves and write something down, that helps me reflect on myself.' -Focus group participant

At a setting level, the program's launch was delayed due to extended time being needed to investigate and test solutions for displaying content and collection of objective engagement data. Some adaptations were made to the intervention delivery platform due to the lack of resources and availability of appropriate technology, leading to a delay in the

program being available to launch. As a result of these technological limitations, no data could be collected regarding what proportion of the intervention's activities were genuinely attempted. Difficulties in program implementation also arose due to the ongoing requirement for staff to monitor sign-ups and enrol students in the program.

Maintenance

Over the course of the trial period, barriers to program maintenance arose between January-November 2022 when the lead investigator (UK) was unavailable to oversee the project. A members of student services' staff was appointed to manage recruitment and participant data during the interim. Changes in staff roles, other competing program initiatives, and conflicting demands on staff responsibilities caused significant disruption to the program's promotion and recruitment. As a result, no further recruitment efforts were made, and no data collection occurred after April 2022. The last enrolment to the program occurred in October 2022. Final access to the program occurred in September 2022 despite the program being offered via the student services website until September 2023. Due to lack of handover between staff, enrolments to the FMP were unmanaged after October 2022. Participant engagement with the study (survey completion) declined significantly during the treatment and follow-up period. Between baseline (n = 173), end of treatment (n =19), and follow-up (n = 12) study attrition reached 93%.

During the trial period no data was collected regarding presenting issues for students accessing the services. From October 2022 to September 2023, however, presenting issues were recorded for all service contacts. Perfectionism was a primary concern for 10 students and a comorbid concern for a further 46. Of the total number of presentations to the service, perfectionism was identified as a concern for 1.39% of cases.

Discussion

372

The FMP was created in response to the rising demand for student wellbeing services on university campuses across the UK (Thorley, 2017). This trial intended to help reduce the treatment gap by providing students with an easily accessible, low-intensity intervention which addressed a transdiagnostic risk factor for poor mental health and wellbeing. The RE-AIM framework was applied to critically assess the successes and challenges of this trial's implementation, and to guide future iterations of the program. There is disparity between the need of students and universities to have access to inclusive, effective, and scalable wellbeing interventions and the uptake of these services when they are being offered (Remskar et al., 2022).

The scalability of the online program meant reach was initially high via student emails, with the potential for reach to be increased by offering the FMP to more faculties or departments. This potential was not realised, however, due to the limited promotion the program received after the initial launch. Participants suggested timing of the program's launch, positive beliefs about perfectionism, and lack of peer promotion were some of the key barriers to uptake. Stigmatising beliefs (e.g., self-development is not as important as academic success, perfectionism is not a problem worth of seeking help for) appeared to downplay the difficulties that perfectionism can cause and limited the perceived relevancy of the program. Participants of the focus groups and interviews identified a lack of mental health literacy around the negative impacts of perfectionism and a reluctancy to seek professional support for perfectionism even when the detrimental effects are known. This highlights a challenge with reach and one solution may be to offer the program in such a way that the negative impacts of perfectionism are marketed and targeted, but that the word perfectionism is removed from recruitment material and the intervention content. These barriers to implementation highlight the need for improved education and tailored promotion so that students understand the benefits of addressing perfectionism prior to engaging with the

program. A greater understanding of, and socialisation to, the meaning and adverse impacts of perfectionism is needed to improve intervention reach, for both students and staff in Student Services. Psychoeducation about the differences between perfectionism and high standards, the central role of self-criticism in producing adverse consequences such as procrastination, could be helpful. Representativeness of the sample population was adequate except for age and gender, where older youths and females were more likely to use the intervention. These findings are congruent with evidence suggesting females and older adults exhibit greater help-seeking behaviours from professional services (Bryant et al., 2022; Mackenzie et al., 2006).

In the intent-to-treat analysis, significant improvements were found for all outcome measures at end of treatment and one-month follow-up. This is consistent with meta-analytic evidence regarding the usefulness of CBT for perfectionism (Galloway et al., 2022; Robinson & Wade, 2021), where medium to large effect size decreases are noted for perfectionism, and medium effect decreases for depression, anxiety, and disordered eating. It is also consistent with hypotheses about the transdiagnostic nature of perfectionism as a risk factor for depression, stress, anxiety, OCD, and eating disorders (Egan et al., 2011). High rates of attrition in the current study likely drove wide confidence intervals and lack of specificity in the effect size estimates, particularly in the completer analysis. Therefore, limited conclusions can be drawn about the effectiveness of this intervention since real-world implementation was only partially successful. Both a strong effect on outcome measures and successful implementation needs to be achieved to consider an intervention effective. Qualitative feedback via focus groups likely provided a limited perspective of participants' overall experience with the FMP due to sampling bias. Participants self-selected to participate in the feedback session and non-completers were not contacted. As a result, qualitative information

likely provides a positively skewed picture of the program's acceptability and fails to explore reasons for drop out and non-adherence.

The FMP initially received strong support from researchers, IT, and counselling staff during the program's development. However, difficulties in staffing continuity led to significant disruptions in promotion and support for the program. Organisational leaders were included in the design and planning of the intervention, yet the lack of adequate handover between staff meant that awareness of the program and its relevancy deteriorated with employee turnover. Advocacy from organisational leaders may improve adoption by other staff members. Similarly, further efforts to investigate the barriers to adoption experienced by university stakeholders could have been undertaken via surveys, interviews, or focus groups in a manner similar to what was offered to student participants. The perceived relevancy of perfectionism amongst the student population likely impacted the FMP's adoption by counselling staff. Only 1.4% of students accessing Student Services rated perfectionism as a concern. This is likely in part due to perfectionism being viewed as a normal or desirable trait, or a lack of understanding of the mental health issues that stem from perfectionism. Conversely, students who had completed the FMP indicated the program had increased their awareness of the impact of perfectionism in their own lives and readily identified positive views about perfectionism amongst the student population. Improved education and understanding about the impacts of perfectionism is needed to increase the perceived relevancy and adoption of the program for both students and staff.

Attrition was a significant limitation and likely impacted on the true efficacy of the intervention due to few participants receiving an 'adequate dosage'. Poor engagement is a major pitfall with ehealth interventions and high attrition rates are common in online programs targeted towards youth (Achilles et al., 2020). A limitation of the current study was,

despite low engagement across the trial period, no adaptations were made to the study protocol to investigate whether retention rates could be improved. Future iterations of the FMP could benefit from exploring strategies to improve engagement such as offering support on demand, check-in emails, or progress tracking. One suggested reason for high attrition rates was online engagement fatigue (Maloney et al., 2023). Online engagement fatigue is an emerging phenomenon relating to the lack of engagement, enthusiasm, and motivation for online learning due to the increase in online education driven by the COVID-19 pandemic. As this study was conducted in late 2021, after the reopening of campuses for UK universities, it is possible students were saturated by online content and preferred face-to-face services where possible. Similarly, adherence measures used in this study provided a limited understanding of participants' true engagement with the FMP. Metrics used to capture website traffic provide information relating to the time spent completing online activities, what Yardley et al. (2016) termed microlevel engagement. Yet the extent to which participants experience a deeper level of cognitive absorption, termed macrolevel engagement, is unknown. Interest, immersion, and intervention usage are all important components for effective engagement which are a prelude to the behavioural change process (Short et al., 2018). Attention checks, reflective learning questions following each module, and measures of behavioural change outside of the program would be highly informative and provide a better understanding of the real-world implications and behaviour changes participants experienced as a result of engaging with the program.

The FMP showed excellent potential to be sustainably offered as an adjunct therapy via Student Services. The FMP was successfully integrated into routine use by wellbeing staff during the first half of the trial period and was also accessible via the Student Services wellbeing webpage for the duration of the study. Despite these initial successes, ongoing staff support to was needed maintain promotion, enrolments, and administration for the program.

Conflicting staff responsibilities and a lack of clarity for who was responsible for the program contributed to its lack of sustainability. Future iterations of the program may benefit from ensuring program coordination is integrated into the official role responsibilities for a staff position within the university. Several of the duties currently assigned to a member of staff may be better supported with full technical support such as automatic enrolments and chatbot support. The program requires sustained support and advocacy for it to be successfully implemented.

Lessons Learned

While the use of therapist-supported online interventions for mental health are shown to be as effective as face-to-face therapy (Hedman-Lagerlöf et al., 2023), barriers and challenges to dissemination of such interventions have been previously identified (Andersson & Titov, 2014). Continued efforts to resolve these barriers is paramount to effectively make use of this valuable intervention option. To this end, the current investigation informs not only barriers but also solutions.

Three key issues were identified with implementation in the current study: a lack of ongoing advocacy for the program to maintain visibility to students, a lack of staff resources to maintain program enrolments, and a lack of perceived need for a perfectionism intervention amongst students accessing wellbeing support. These challenges suggest this study underrepresents the potential effectiveness and success of similar digital wellbeing interventions that have greater visibility or resource allocation. Too little advocacy of the FMP meant that despite initial enthusiasm and backing, implementation of the program was ultimately unsuccessful. Possible improvements for future implementations include greater collaboration with key stakeholders, responsibilities that are linked to roles and not individuals for those involved in the program's administration, and better utilisation of

student advocacy for the program's dissemination. Decision-makers and organisational leaders need to be included in the program's development and implementation so that they are aware of what the program is, why it should be advocated for, and assist with making any required changes to the program after its launch. These aims and processes need to be adequately documented to allow for successful handover during periods of staff turnover. Additionally, incorporating the study's administration duties within a staff member's role and setting a clear end date for data collection may help to maintain the program's integrity. Finally, promotion by students and peer mentors, as well as timing the marketing to coincide with the start of the academic year, may increase the perceived relevancy and visibility of the program. This implementation trial highlights the need for improved education on the characteristics and effects of perfectionism so that both students and counselling staff can identify when perfectionism is impacting a student's wellbeing and when it may benefit from intervention.

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Table 1: Demographic information for study sample and University of Bath student population

	Study sample n (%)	**Student population (Core student population only)**
Age range	17-64 Under 21: 71 (41%) 21 and over: 102 (59%)	Under 21: 13,551 (98%) † 21 and over: 303 (2%) †
Gender	Female: 118 (68.2%) Male: 42 (24.3%) Non-binary: 1 (0.6%)	Female: 9,004 (45%) Male: 10,884 (55%) Non-binary: 38 0.002%
Level of study	Undergraduates: 106 (61%) Postgraduates: 55 (32%) Non-disclosed: 12 (7%)	Undergraduates: 13,854 (70%) Postgraduates: 6,072 (30%)
Ethnicity	White: 105 (61%) BAME: 54 (31%) Non-disclosed: 14 (8%)	White: 13,225 (66%) BAME: 6,317 (32%)
Faculty	Engineering & Design: 29 (17%) Humanities & Social Sciences: 117 (67.6%) School of Management: 5 (3%) Science: 6 (3.5%)	Engineering & Design: 3,806 (19%) Humanities & Social Sciences: 6,670 (33%) School of Management: 3,029 (15%)

| | Cross Faculty: 2 (1%) | Science: 6,033 (30%) |
| | Non-disclosed: 12 (7%) | Cross Faculty: 388 (2%) |

Note: †information only available for core undergraduate students. BAME= Black, Asian, and Minority Ethnic

Table 3: Within time effect sizes estimated from LMM output for EoT and Follow-up (*n*=22), including baseline observation as a covariate

Variables	Baseline Covariate	Estimated Mean (SE) at EoT	Estimated Mean (SE) at FU	Cohen's d EoT (95% CI)	Cohen's d FU (95% CI)
ED15	1.60	1.05 (0.14)	1.31 (0.09)	-1.04 (-1.27, -0.81)	-1.77 (-2.02, -1.52)
DASS21 Depression Subscale	4.90	5.18 (0.87)	3.12 (0.54)	-0.40 (-0.63, -0.17)	-1.31 (-1.55, -1.07)
DASS21 Anxiety Subscale	3.72	3.37 (0.59)	2.78 (0.59)	-0.52 (-0.75, -0.30)	-0.95 (-1.19, -0.72)
DASS21 Stress Subscale	8.14	6.40 (0.71)	6.72 (0.66)	-0.71 (-0.95, -0.48)	-1.10 (-1.33, -0.87)
FCRS- Inadequate	23.03	16.19 (1.42)	16.53 (1.65)	-1.13 (-1.37, -0.89)	-2.13 (-2.38, -1.87)
FCRS- Reassure	18.21	19.12 (0.66)	18.85 (0.98)	0.59 (0.37, 0.82)	1.37 (1.14, 1.60)

FCRS- Hated Subscale	4.14	3.00 (0.60)	3.86 (0.89)	-0.47 (-0.70, -0.25)	-1.15 (-1.38, -0.93)
FMPS-CM Subscale	34.20	23.88 (1.01)	24.33 (1.25)	-0.82 (-1.05, -0.58)	-0.94 (-1.18, -0.70)
FMPS-PS Subscale	28.45	24.27 (0.78)	25.50 (0.97)	-0.64 (-0.87, -0.41)	-0.33 (-0.56, -0.11)
CEQ C	6.40	7.17 (0.35)	6.45 (0.46)	0.44 (0.22, 0.67)	0.25 (0.03, 0.48)
CEQ E	4.44	5.17 (0.45)	4.64 (0.63)	0.44 (0.21, 0.66)	0.24 (0.01, 0.46)
WEMBS	43.14	46.16 (1.71)	51.12 (2.48)	0.52 (0.23, 0.75)	2.45 (2.20, 2.71)
WCS	32.18	26.84 (3.02)	23.43 (3.74)	-1.48 (-1.71, -1.24)	-2.55 (-2.81, -2.30)

Note: EoT= End of treatment, FU= Follow up; within group effect sizes corrected for correlations between observed value

Table 4: Completer analyses, paired samples *t* tests corrected for correlated observations, for end of treatment and follow up

Variable	Baseline (n=19)		End of Treatment (n=19)		Cohen's d 95% CI	Baseline (n=11)		Follow up one month (n=11)		Cohen's d 95% CI
	M	SE	M	SE		M	SE	M	SE	
ED15	1.37	0.21	0.64	0.18	**-0.91 (-1.44, -0.36)**	1.21	0.39	0.86	0.27	-.59 (-1.25, 0.10)
WCS	36.05	4.96	29.04	4.43	0.13 (-0.44, 0.46)	24.83	6.21	19.67	7.07	-.62 (-1.28, 0.08)
DASS21 Depression	5.26	0.82	5.32	0.96	-0.16 (-0.61, 0.30)	4.20	0.96	2.8	0.70	-.38 (-1.02, 0.27)
DASS21 Anxiety	4.00	0.68	3.53	0.64	**-0.47 (-0.93, -0.15)**	3.20	0.65	2.50	0.73	-.62 (-1.29, 0.07)
DASS21 Stress	8.05	0.79	6.37	0.77	**-0.92 (-1.45, -0.37)**	8.30	1.00	6.80	0.85	-.91 (-1.64, 0.15)
FSCRS Inadequacy	23.32	1.56	16.37	1.54	0.25 (-0.21, 0.70)	22.50	2.93	16.30	2.27	.00 (-0.62, 0.62)
FSCRS Reassure	17.79	1.82	18.84	1.28	-0.26 (-0.71, 0.20)	19.00	1.97	19	1.67	.03 (-0.59, 0.65)
FSCRS Hated	4.16	0.97	3.00	0.62	0.40 (-0.08, 0.86)	4.10	1.79	4.20	1.35	**.83 (0.09, 1.54)**
WEMWBS	42.74	2.22	46.47	1.85	**0.52 (0.04, 1.00)**	43.90	3.04	50.40	3.85	-.21 (-0.83, 0.42)

CEQ Credibility	6.26	0.26	7.15	0.36	0.25 (-0.22, 0.70)	6.67	0.46	6.2	0.81	.20 (-0.43, 0.82)
CEQ Expectancy	4.56	0.55	5.09	0.51	**-1.21 (-0.60, -1.80)**	4.2	0.74	4.63	1.06	**-.81 (-1.48, -0.11)**
FMPS-CM	34.26	1.54	23.68	1.13	**-0.82 (-1.34, -0.29)**	32.55	2.43	24.73	1.87	-.42 (-1.06, 0.24)
FMPS-PS	28.74	0.99	24.84	0.97	**-0.47 (-0.94, -0.01)**	28.00	1.65	24.60	1.89	-.44 (-1.08, 0.23)

Table 5: Engagement data for active users of the FMP

Module	Number of users per module	Number of participants who completed this many modules	Time (minutes) spent on each module (per user)
1	108	23	17
2	85	19	23
3	65	16	22
4	49	16	16
5	35	6	26
6	28	8	24
7	20	2	22
8	19	18	14