The Impact of Knowing: Causal Attributions and Beliefs about Risk Factors for Breast Cancer

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Declaration

I, Jo Anne Dumalaon, certify that this thesis does not incorporate without acknowledgment any material previously submitted for a degree or diploma in any university; and that to the best of my knowledge and belief it does not contain any material previously published or written by another person except where due reference is made in the text.

Abstract

Breast cancer is one of the most common cancers in Australia. Previous research has shown that affected women (i.e., women with a previous diagnosis of breast cancer) sometimes make cancer causal attributions, that is, they identify factors they believe may have contributed to their own cancer and/or to the cancer of other women. These attributions may be seen as a way of making sense of their illness experience and have been found to influence physical health, by impacting health behaviors post-diagnosis, as well as psychological well-being. In the broader population, unaffected women (i.e., women without a previous diagnosis of breast cancer) may also have opinions or beliefs about cancer causation.

Chapter 1 presents an up to date review of the incidence, prevalence, background on biological basis of cancer, and risk factors for breast cancer. It also provides a comprehensive summary of survivorship and psychological needs of affected women. A discussion on cognitive adaption theory and the role of attributions in coping, psychological adjustment, and health behaviors of affected women post-diagnosis is also presented.

This chapter also elaborates on a methodological discussion of previous work on causal attributions for breast cancer. There are a number of studies that have been conducted on the said topic; however, it could be observed that there is heterogeneity in how attributions were previously measured. Results of past research on attributions have also not been synthesized. It is unclear if attributions for breast cancer vary according to the referent under consideration (e.g., affected versus affected women, self-referent versus other-referent) and if it contributes to differences in psychological outcomes among affected women. These observations help provide a solid rationale for the thesis. This

chapter concludes with an outline of the overall research aims and a description of how chapters are connected and relevant to the research aims and objectives of the thesis. The significance of the thesis as a whole is also discussed.

The aim of the research incorporated in this dissertation was to investigate whether causal attributions for breast cancer differ between affected and unaffected women. Findings can help provide insights on how existing health promotion programs that aim to motivate desired attitudes and health behavior changes, can be further improved to help alleviate breast cancer risk. Affected women's causal attributions for their own breast cancer were also compared to current evidence-based risk factors for breast cancer. It is crucial to understand cancer causal attributions and the impact that these have on psychological outcomes of affected women. Furthermore, this project explored whether different causal attributions have a differential impact on measures of fear of cancer recurrence and psychological well-being among affected women.

In Chapter 2, a systematic review was reported based on 24 qualitative and quantitative studies, published between 1982 and 2012, reporting causal attributions for breast cancer among affected women. Results indicated the existence of a consistent belief among women that their own breast cancer could be attributed to family history, environmental factors, stress, or chance. Lifestyle factors were less frequently identified, despite health recommendations highlighting the importance of these factors in controlling and modifying cancer risk.

Chapter 3 documented methodology adopted in Chapters 4 and 5. It provides information on the setting of the study, inclusion criteria and recruitment of participants, response rate, ethical considerations sought and granted, and steps on how data were collected. In order to further understand and compare beliefs about the causes of breast cancer among women, an attribution checklist questionnaire, "Beliefs about Breast Cancer

Risk Factors"(BBCRF), was developed for this thesis. This questionnaire consisted of risk factors for breast cancer identified by reputable resources including the Australian Institute of Health and Welfare (AIHW, 2012), the World Cancer Research Fund (WCRF/AICR, 2007), the International Agency for Research on Cancer's review of human carcinogens and lifestyle factors (IARC, 2010), and a chapter on breast cancer risk factors from the Breast Cancer: Risk Reduction and Early Detection Strategies textbook (Newcomb & Wernli, 2010). It also included causal attributions for breast cancer identified by women in a systematic review (Chapter 2), such as stress, and chance or bad luck. This measure was utilized in both Chapters 4 and 5. Description of how the BBCRF was developed, information on its validity and reliability, and how items could be considered individually or grouped into rational categories are provided in this chapter. A description of the psychometric properties of the established instruments used in Chapter 5 to measure fear of cancer recurrence, psychological well-being, and dispositional optimism is also provided. This chapter also describes statistical techniques employed to analyze quantitative data as well as thematic analysis for qualitative data.

To investigate if the degree of endorsement of specific risk factors as causal to breast cancer vary according to the referent under consideration by affected women (i.e., self or other), the BBCRF was utilized to compare attributions within a sample of affected women (n = 314) for their own and other women's breast cancer. Items of the BBCRF were aggregated according to eight casual attribution categories (five rational groupings and three individual or single-item attribution categories.) The five rational groupings were biological attributions, environmental attributions, reproductive history, breastfeeding and hormones, lifestyle, and causal attributions identified but not validated by expert consensus. The three individual attributions were stress, chance or bad luck, and smoking. Results showed that affected women indicated greater endorsement of biological attributions, environmental attributions, reproductive history, breast-feeding, and hormones, lifestyle, and other causal attributions identified but not validated by expert consensus and the individual attribution, smoking, when asked to rate causes of breast cancer in others than when considering the cause of their own cancer. These suggest that affected women's cancer attributions are influenced by the referent under consideration (i.e., self or other). It is important to note that no significant difference was found in the endorsement for stress and chance/bad luck by affected and unaffected women suggesting that these risk factors were equally endorsed as a cause of their own and other women's breast cancer.

The second aim of Chapter 4 was to see if affected women's degree of endorsement of specific risk factors as causal to other women's breast cancer, was similar to causal beliefs held by unaffected women (n = 160). Results showed that the degree of endorsement for the causes of breast cancer in others was similar between affected and unaffected women which mean that public perceptions about the causes of breast cancer in general for all risk factors may be largely comparable.

Chapter 4 also reported a categorical analysis of attributions stratified by dummy coded socio-demographic variables which showed that participants' personal background such as family history of breast cancer, age, education, and previous smoking history may have some bearing on their degree of endorsement of specific risk factors as causal to breast cancer. In contrast, results of categorical analysis of attributions for unaffected women, suggest that their endorsement of risk factors as causal to breast cancer was not influenced by their personal background

These results were interpreted as consistent with existing theory and provided insight into the possibility that attributions of causality among women with breast cancer might have potential implications for psychological well-being. Consistent with the attributional dimension patterns posited by Weiner (1985, 1986), the results suggested that the most frequently identified causal attributions, such as stress, and family history, may be characterized as uncontrollable and stable, which are dimensions that are associated with poorer adjustment. The strong endorsement of stress was also consistent with Epstein's cognitive-experiential self-theory (2000, 2003). It is possible that for affected women, the experiential processing system and emotions may have a greater influence on the type of causal attributions identified. Moreover, the consistent lack of endorsement of modifiable risk factors as causal to their own diagnosis suggests that both affected and unaffected women may not be fully aware of, or inadvertently disagree with, health messages that cancer can be linked in some circumstances to specific lifestyle choices.

To further understand if there is a relationship between self-referent causal attributions and psychological outcomes, the study reported in Chapter 5 aimed to investigate the relationship between affected women's self-referent causal attributions and fear of cancer recurrence (FCR) and psychological well-being (*n* = 314). The potential moderating role of optimism was also considered. Results indicated that biological attributions and stress were associated with greater FCR. Stress as a causal attribute was negatively associated with well-being. Optimism did not moderate the relationship between self-referent causal attributions and FCR or well-being.

The finding that a focus on non-modifiable causes for cancer among affected women was associated with greater fear of cancer recurrence is also a critical result with implications for support services. Triaging for these services might be assisted by incorporating screening of survivors' attributions for cancer causation so that those likely to experience higher fear of cancer recurrence are identified as early as possible and counseling provided to help cope with this significant stressor. Identification of

attributions may be used as a strategy to identify affected women who have difficulty in cognitively adapting to their cancer (Taylor, 1983) as well as those may have difficulty in finding meaning or independently resolving cancer-induced existential concerns (Park, Edmonson, Fenster & Blank, 2008).

In the context of the broader population, findings suggested that modifiable risk factors are also not widely recognized by women without breast cancer, despite the cancer prevention messages currently communicated by health experts. Furthermore, the similarity between affected and unaffected women's degree of endorsement of specific risk factors as causal to breast cancer generally may indicate that there is still a need for health promotion programs on risk factors for breast cancer and opportunities for lifestyle interventions in both primary breast cancer prevention and survivorship.

The concluding chapter discussed the potential theoretical and clinical implications of the results of the thesis as a whole. It was recommended that health promotion programs continue to promote the scientific evidence about breast cancer causation with a focus on debunking widespread myths and highlighting the impact of lifestyle choices. The discussion also highlighted the importance of targeting beliefs that might predict unhealthy behaviors, including lifestyle choices that might follow from stress, particularly given the finding that stress was commonly endorsed as a cause of breast cancer by both affected and unaffected women, despite the lack of scientific evidence. Together, these findings suggest the potential to apply a dual processing model (Epstein, 1994, 2000) to understand how attributions might be constructed and that messages that target both rational and experiential information processing systems might be needed in communicating cancer prevention messages.

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To God be the Glory.

Chapter I

Introduction

This first chapter reviews the current literature on breast cancer incidence, risk factors for breast cancer, and beliefs that affected women (i.e., women with a previous diagnosis of breast cancer) have about the cause of their cancer and the implications for the survivorship experience. Key theoretical models that explain attributions will be introduced, describing influences on attribution ascription. Outcomes of causal attributions for affected and unaffected women (i.e., women without a previous diagnosis of breast cancer) will also be discussed. Finally, the thesis aims are outlined at the end of the chapter.

Breast Cancer Incidence

Breast cancer is the most frequently diagnosed cancer in women. According to the latest GLOBOCAN report data, an estimated 1.7 million women were diagnosed with breast cancer in 2012 (Ferlay et al., 2015). Rates of breast cancer incidence also vary greatly worldwide, with higher incidence of breast cancer cases observed in Northern America, Australia/New Zealand, and Northern and Western Europe and lower incidence for countries in most of Africa and Asia (Torre et al., 2015). This may be due to availability of breast cancer screening programs (because an increase in the number of women attending screening would be very likely to lead to an increased number of cancers being detected), an aging population, and differential prevalence of risk factors in developed countries (Torre et al., 2015).

In Australia, it is estimated that 15,934 new cases of breast cancer among females were diagnosed in 2016 (AIHW, 2016). It is acknowledged that breast cancer also occurs in men however, due to the relatively small numbers of men affected (Giordano, Buzdar, & Hortobagyi, 2002), the present thesis focuses exclusively on breast cancer among women.

Biological Basis of Cancer

Cancer is a disease within genes. It is believed to develop as a multistage disease driven by the build-up of mutations or abnormal changes in the DNA of a gene that control cell growth and proliferation (NCI, 2015). The two broad classes of cancer-critical genes, or genes whose mutation contributes to the causation of cancer, are called proto-oncogenes and tumor suppressor genes. The mutant form of pro-oncogenes are oncogenes which arise from too much activity of the gene product. In contrast to the activating mutations that generate oncogenic allelles from proto-oncogene precursors, tumor suppressor genes and the proteins they encode are functionally inactivated by mutations. This means that loss-of-function mutation in the tumor suppressor genes contribute to cancer risks (Alberts et al., 2002; Bunz 2016). It is estimated that 5% to 10% of cases of breast cancers are caused by a germline pathogenic variant in the tumor suppressor genes: *BRCA1* mapped to chromosome 17 (17q) and *BRCA2* on chromosome 13 (13q) which predispose individuals to breast as well as ovarian cancers (Petrucelli, Daly, & Fieldman, 2013).

Most cancers arise from accumulation of somatic (or acquired) cellular mutations in affected cells that occur after conception. In contrast to germline mutations, which are inherited, somatic mutations do not occur in the sperm or egg cells so it cannot be passed on to children and are acquired during one's lifetime. These somatic changes can occur through exposure to carcinogens in the environment, circulating hormones, lifestyle factors, or simply because of random mutations that occur during cell division.

Inherited genes can also influence faster accumulation of somatic mutations if they cause other genes to mutate. Age is an important risk factor for most cancers, because the longer a person lives, the greater time there is for mutations to accrue in the affected cells (NCI, 2015; Joy, Penhoet & Petitti, 2005).

Family history of cancer can also arise from a shared environment that increases risk; common environments and similar lifestyle-related behaviors are observed among family members. For example, it is possible that a shared history of smoking, high alcohol consumption, and low exercise, can cause a similar cancer to develop among family members even without an inherited genetic mutation (Wilson, Jones, Coussens, & Hanna, 2002). The observation that migrants can potentially acquire the disease profiles of their adopted country also highlight the potential contribution of environmental factors in cancer causation (Pelengaris, 2013). Moreover, in people with germline mutations, genetic changes, together with environmental and lifestyle factors, also influence whether a person will develop breast cancer. Hemminki and Mutanen (2001) describe cancer as a polygenic multifactorial disease, which makes environmental and lifestyle factors an important modifier in the risk of cancer (p.29). Due to the high incidence of breast cancer among women, there is a need to understand the lifelong interplay of hormones, environmental and lifestyle factors and how this contributes to or interacts with acquired mutations in various genes (Hankinson, Colditz, & Willet 2004).

Risk factors for Breast Cancer

Epidemiologic studies have reported that increased risk of breast cancer is associated with intrinsic (or internal) and extrinsic (or external) characteristics. Intrinsic risk factors include familial and genetic predisposition, age, endogenous hormonal factors, and benign breast lesions confirmed pathologically to confirm high risk (Kruper & Tchou, 2006; Newcomb & Wernli, 2010; Tchou & Morrow, 2003; The International Agency for Research on Cancer (IARC), 2010). Risk of being diagnosed with breast cancer increases steadily with age, and is higher in postmenopausal women than premenopausal women. Furthermore, breast cancer is associated with endogenous hormones and there is evidence for increased risk linked to early menarche, late menopause, nulliparity, and late age at first birth. This suggests that an increased number of ovulatory cycles is a marker of increased breast cancer risk (IARC, 2010; Joy et al., 2005; Tchou & Morrow, 2003; WCRF/AICR, 2007). Moreover, an individual's body mass index (BMI) is also highly correlated with circulating estrogen levels, which is considered a surrogate for endogenous estrogen exposure. This may partly explain the link between postmenopausal obesity, and increased risk of breast cancer (Chen, 2008).

Extrinsic breast cancer risk factors include exogenous hormones, environmental exposures such as exposure to particular pesticides and ionizing radiation, and lifestyle behaviors (Chen, 2008; Fenton & Birnbaum, 2015; Newcomb & Wernli, 2010; IARC, 2010; Tchou & Morrow, 2003; WCRF/AICR, 2007). Approximately 70 percent of affected women who develop breast cancer have a hormone receptor positive cancer, which means that the cancerous tissue contains receptors for estrogen and/or progesterone. This association may, therefore, prove to be more relevant among women with elevated levels of these hormones, such as those who have used hormone replacement therapy (Joy et al., 2005). The role of exogenous hormones in the form of hormone replacement therapy (HRT) in combination with estrogen and progesterone might have been partly associated with a 30% increase in incidence of breast cancer between 1980 and the late 1990s, and conversely to a decline in incidence rates in Western countries when women became more aware of its effects (Chen, 2008; Torre et al., 2015).

According to Phillipps and Venitt (2010), environmental carcinogens tend to be beyond the control of individuals and not usually constrained by personal choice (p.625), whereas lifestyle-related risk factors are characterized as controllable or modifiable (Fraumeni & Schottenfeld, 2006; Ferrucci et al., 2011; Thomson et al., 2014; WCRF/AICR, 2007, 2010). A number of epidemiological studies have reported the contribution of modifiable risk factors such as alcohol consumption, overweight and obesity, and physical inactivity, to the overall breast cancer burden (Fraumeni & Schottenfeld, 2006; WCRF/AICR, 2007, 2010). A recent meta-analysis reported that the risk of breast cancer mortality is increased by around one-third or more in women who are obese compared to those who are normal weight (Chan et al., 2014; Protani, Coory, & Martin, 2010). In addition, Danaei et al. (2005) estimated that 21% of all breast cancer deaths worldwide are attributable to alcohol use, overweight and obesity, and physical inactivity.

Bode and Dong (2009) reported that 23.0% of (postmenopausal) breast cancer cases can be attributed to overweight and obesity, 16.5% of breast cancers can be attributed to physical inactivity, and 7% to alcohol consumption. Howell et al., (2014) also estimated that lifestyle measures including weight control, exercise, and moderating alcohol intake, could reduce breast cancer risk by about 30%. A recent study by Tamimi et al. (2016) reported that when considering only modifiable risk factors in postmenopausal breast cancer, changing one’s risk factor profile to the lowest weight gain since age 18 years (i.e., <2-kg weight gain), no alcohol consumption, high physical activity level (i.e., highest quartile), ever breastfeeding, and no current hormone use was associated with a population attribution risk percentage of 34.6% (95% CI: 22.7, 45.4). They also found that the said risk factors for breast cancer could potentially reduce postmenopausal breast cancer incidence rates by 114 cases per 100,000 women-years (p.886-887). These studies show that modifiable risk factors make a substantial contribution to breast cancer incidence and that promoting awareness of, and providing support for adherence to risk minimizing lifestyle choices is an important part of cancer control activities (Dunn, Holland, Hyde, & Watson, 2015).

Recent research attests to the efficacy of public health messages designed to educate women about modifiable risk factors and lifestyle approaches to prevention. Cloud, Thai, Liao, and Terry (2015) reported that women with a personal history of breast cancer, or those who come from high risk families, who observed all breast cancer prevention guidelines (i.e., advice on physical activity, alcohol consumption, and keeping a healthy weight) experienced a significant reduction in mortality compared to women who only adhered to one guideline. Adherence to lifestyle guidelines may also assist in reducing the risk for other comorbidities linked to cancer and improve overall quality of life (Ambrosone, Hong, & Goodwin, 2015; Ganz & Goodwin, 2015).

Breast Cancer Survivorship

There has been a significant decrease in breast cancer mortality arising from advances in treatment as well as early detection of breast cancer. However, it is important to note that the range of 5-year net survival vary greatly. Ginsburg et al. (2016) reported that for women diagnosed during 2005 to 2009, the 5-year net survival was 80% or higher or higher in 34 countries such as Australia wherein individuals diagnosed with breast cancer had a 90% chance of surviving for 5 years. However the 5 year net survival is much lower in developing countries such as India (60%), Mongolia (57%), and South Africa (53%). This means that despite the rising incidence, a growing number of women continue to live after a breast cancer diagnosis, particularly in more developed countries.

Notwithstanding improvements in survival outcomes for affected women, a vast amount of literature has documented the physical and psychosocial difficulties that breast cancer survivors experience. Initially, receiving a breast cancer diagnosis is profoundly stressful for most women, and can elicit greater distress than any other medical diagnosis, regardless of prognosis (Barraclough, 1999; Ganz & Goodwin, 2015; Mehnert & Koch, 2007; Shapiro et al., 2001). This initial stage may be followed by a period of turmoil and distress, characterized by intrusive thoughts about death and dying, irritability, difficulty sleeping, eating, and concentrating. Patients also worry about the effect of their illness on their family; financial difficulties; and the side effects of treatment (Barraclough, 1999; Ganz & Goodwin, 2015).

Burgess et al. (2005) reported that the prevalence of depression, anxiety, or both in the year after breast cancer diagnosis is around twice that of the general female population. The reasons for this are likely to be complex and include fear of both treatment and possible outcome. In a focus group discussion with cancer survivors and health professionals, both groups agreed that psychological distress came with the "changed identity" associated with cancer diagnosis, regardless of stage and type of cancer (Jefford et al., 2008). A diagnosis of cancer is life-altering and can lead people to question their beliefs about themselves and the world (Janoff-Bulman, 1992; Lepore, 2001;). Cancer survivors also reported feeling stigmatized at the thought that their behavior could have contributed to the development of their cancer. Patients have asked themselves if they were to blame, did something wrong or could have done something to prevent their cancer (Lebel & Devins, 2008).

Immediately after treatment, varying levels of health and well-being are observed among cancer survivors (Stanton & Bower, 2015). There are affected women who are remarkably well-adjusted (Costanzo et al., 2007) and are able to resume normal activities and may even remark on having "benefited" from the experience (Sears, Stanton, & Danoff-Burg, 2003). This has been identified as indicative of "post-traumatic growth". Theories of post-traumatic growth posit that positive psychological outcomes can follow the experience of a traumatic event. These can include an increased appreciation for life, renewed relationships with others, a sense of increased personal strength, and enhanced spiritual well-being (Calhoun & Tedeschi, 2014; Kolokotroni, Anagnostopoulos, & Tsikkinis, 2014; Sears et al., 2003). In a systematic review, optimism and adaptive coping styles such as positive reappraisal, seeking social support, and religious coping were reported as correlates of post-traumatic growth in cancer patients (Shand, Cowlishaw, Brooker, Burney, & Ricciardelli, 2015). Others, however, spend many years dealing with psychological sequelae following diagnosis.

Past research has found that breast cancer patients in general have lower physical and mental health-related quality of life than females in the general population (Baker, Haffer, & Denniston, 2003; Dorval, Maunsell, Deschenes, Brisson, & Masse, 1998; Gold et al., 2016). Schou, Ekeberg, and Ruland (2005) reported that the social, cognitive, and emotional functioning of women in the period immediately following their breast cancer diagnosis was lower than the general population and these women continued to have lower social and cognitive functioning scores one year later. A prospective Australian study showed that, in the first two years after developing breast cancer, middle-aged women experienced significant reductions in general health, physical and social functioning and this was accompanied by increased feelings of stress (Wade & Lee, 2005).

A range of unmet needs have also been identified in affected women. Even after successful treatment, breast cancer survivors indicated concerns about their emotional health (Stanton et al., 2005). Gold et al. (2016) reported that around 44.5% of affected women prior to and for six months following breast cancer surgery had combined anxiety and depressive symptoms (CADS). Demographic and clinical characteristics showed that affected women with CADS were younger, nonwhite, had lower performance status, and received neoadjuvant or adjuvant chemotherapy. They were also found to have decreased coping self-efficacy, felt a loss of control, greater sense of isolation, and increased fear of cancer recurrence. Similarly, Burgess et al. (2005) suggested a number of risk factors for persistent anxiety and depression among women with a diagnosis of breast cancer: previous psychological treatment, lack of an intimate confiding relationship, younger age, and previous severely stressful non-cancer life experiences.

Furthermore, Sharpley and Christie (2007) also found that affected women who continued to experience persistent anxiety and depression two years after diagnosis were more concerned with feelings of losing control and inability to cope with daily demands than with somatic complaints. In a recent systematic review of 17 studies, relating to long-term symptoms of depression and anxiety after breast cancer treatment, Maas, Roorda, Berendsen, Verhaak, & de Bock (2015) observed a wide range in prevalence of long-term symptoms of anxiety (17.9% to 33.3%) and depression (9.4% to 66.1%). This may mean that for some affected women, their symptoms of psychological distress can diminish over time, however, others may need the attention of mental health professionals for support and treatment of psychological symptoms. These results also suggest that symptoms of psychological distress were related to the patient rather than to disease or treatment, and that some women need more support than others in managing cognitive and emotional concerns related to the diagnosis (Burgess et al., 2005).

Fear of cancer recurrence is one of the single largest causes of anxiety among affected women, particularly when all adjuvant and hormone treatments have been completed (Koch, Jansen, Brenner, & Arndt, 2013; Oxlad, Wade, Hallsworth, & Koczwara, 2008). A multicenter, prospective longitudinal study found that a third of cancer patients (N = 1,425) identified fear of cancer recurrence as their number one unmet need immediately following the cessation of treatment (Armes et al., 2009). Fear of cancer recurrence includes broad levels of distress, ranging from normal psychological reactions to clinical levels of psychological depression, anxiety and stress. At low levels, these reactions can be considered a normal and temporary emotional reaction to the cancer that can lead to an appropriate awareness for signs of possible recurrence, and enhance subsequent adherence to recommended health behaviors. However, these reactions become clinically significant or problematic when they lead to disproportionate fear.

Younger cancer survivors, patients who experience high levels of pain and fatigue, those who have low optimism, and those who have higher anxiety and depression are at risk of higher fear of cancer recurrence (Simard et al., 2013). As fear of cancer recurrence was also found to be inversely associated with coping self-efficiacy, helping affected women cope with unrealistic fears and giving them access to cognitive strategies which can help in decreasing their anxiety may be a way in which this pertinent need can be met (Dunn et al., 2015).

Cognitive Adaptation Theory

Many people use the word "shock" to describe their reaction at the time of receiving their cancer diagnosis (Salander, 2002). A diagnosis of cancer is considered a traumatic event because of its life-altering and threatening effects. The possibility of death and presence of somatic symptoms results in increased intrusive thoughts and fear (Redd et al., 2001). These are interpretations of the causes of cancer made post-diagnosis.

A highly stressful situation such as being diagnosed with cancer, could also violate or even “shatter” an individual’s global meaning or core beliefs that the world is fair, that life is predictable and that the self is worthy, which could potentially lead to heightened feelings of vulnerability and distress (Janoff-Bulman, 1992, 2004; Park, 2010). Taylor’s (1983) theory of cognitive adaption proposed that adjustment to traumatic or undesirable events revolves around three main cognitive and emotional processing efforts: a search for meaning in the experience, an attempt to regain mastery over a particular event, and finding a way to enhance self-esteem in order to feel good about oneself despite the personal setback.

The search for meaning is most evident at times of crisis. Attribution theory (Kelley, 1967) maintains that following a threatening or dramatic event people will make attributions about causation in order to understand why a crisis occurred and its impact

(Taylor, 1983). Moreover, meaning is reflected in questions such as “Why did I get this illness?" or “What caused this illness?", and “What does my life mean, now that I am diagnosed with cancer?” (Park, 2008). An attributional search may provide a way for cancer patients to understand their illness and any accompanying symptomatology as well as its personal significance (Roesch & Weiner, 2001; Chechatwala, 2011). This is a critical process for many breast cancer patients, particularly where the cause cannot be easily identified. Park (2010) posit that this search for meaning can help in an individual’s efforts to create a fit between their appraisal of their own cancer experience and a positive global meaning, or a belief that the world is meaningful and their own lives as worthwhile. This could help in a more positive psychological adjustment to cancer.

The second aspect of the adjustment process, regaining mastery, is exemplified by beliefs about personal control. A person’s belief that they can control the consequences of their cancer and initiate action that can keep their cancer from recurring can contribute to positive adjustment. A sense of mastery is also achieved if individuals believe that the perceived initial cause of their condition is no longer in effect (Chechatwala, 2011; Taylor, 1983).

Causal attributions can also contribute to an individual’s sense of mastery. Leventhal et al. (1997) reported that beliefs about illness causation can be a motivating factor that can drive patients to make necessary changes in health behavior. Consistent with this, Costanzo, Lutgendorf, and Roeder(2011) argued that changes in health practices are matched with personal beliefs about illness causation. For example, affected women who believe that their past health behaviors contributed to the development of their cancer may be more likely to believe that they can make necessary behavioral changes in order to increase their control (Costanzo et al., 2011; Leventhal et al., 1997; Lowery, Jacobsen, & Ducette, 1993; Taylor, 1983).

The third aspect of the adjustment process is the need to enhance self-esteem. Individuals need to actively deal with threats to self-esteem that may accompany a cancer diagnosis. Cognitive adaptation theory posits that positively biased illusions are associated with, and foster, better life functioning as well as positive psychological adjustment (Colvin & Block, 1994). Taking the three aspects of cognitive adaptation together, Taylor, Lichtman, and Wood (1984) reported that breast cancer patients who were able to find meaning in the experience, felt a sense of control, were able to restore their self-esteem, and were emotionally better adjusted than those who did not adapt cognitively. This indicates that causal attributions may play an integral role in adjustment and well-being following cancer diagnosis.

Theories of Causal Attribution

The assessment of attributions has taken various forms. Weiner (1985, 1986) proposed that the pattern of attribution is composed of three dimensions – locus, stability, and control. The locus dimension describes whether the attribution is internal or external to the attributor. The stability dimension distinguishes between stable factors which are not amenable to change and those of an unstable nature that vary. The control dimension differentiates between attributions that are controllable and those that are uncontrollable.

One way in which attributions can be characterized is through the use of categories. Categories such as self, other people, heredity, the environment, and chance are typical types of attributions. In a recent study, Ferrucci et al. (2011) categorized causal belief into thematic categories and defined each individual attribution as either internal or external and within (modifiable) or outside (fixed) of an individual's control. In some studies, causal attributions are interpreted as synonymous with self-blame. Janoff-Bulman (1992) suggested that there are two subtypes of self-blame: behavioral and characterological. Behavioral self-blame occurs when an undesirable outcome is blamed on specific behaviors or actions. Characterological self-blame occurs when an undesirable outcome is blamed on one's own character or disposition. An examination of the relationships between these different types of attributions indicated that they were not independent and tended to correlate so that internal, unstable, and controllable attributions (e.g., lifestyle-related factors) were analogous to behavioral self-blame. Heredity can be likened to characterological self-blame and can be categorized as internal, stable, and uncontrollable. External attributions of causality are likely to stem from the environment or from causes such as chance or bad luck and are viewed as having lower controllability (Roesch & Weiner, 2001).

Thirty years ago, when women were asked what caused their own breast cancer, most identified God, fate, chance, or stress, and exposure to carcinogenic substances (Baider & Sarell, 1983; Taylor et al., 1984). Since then, a number of studies have been conducted on causal attributions for breast cancer among affected women. Results of these studies are less well synthesized but even recent studies indicate that women with a previous diagnosis of breast cancer continue to attribute their own cancer to uncontrollable forces outside of their volition (Ferrucci et al., 2011; Willcox, Stewart, & Sitas, 2011).

Evaluation of Studies of Breast Cancer Causal Attributions[1]

Across studies, causal attributions for breast cancer have been measured in different ways reflecting the lack of a standard measure of beliefs about breast cancer risk factors. Variability includes heterogeneity in the number and choice of items, designation of the scale and precise questions asked in questionnaires that aimed to capture beliefs about breast cancer risk factors among affected women.

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[1] Studies reported in this section are also reported in the systematic review presented in Chapter 2.

A few studies have modified existing scales to measure attributions for breast cancer. For example, Kulik and Kronfeld (2005) modified Bar-On's questionnaire (1981) on causes of heart disease, to reflect patients' attributions regarding breast cancer. Other research has made use of the Illness Perception Questionnaire (IPQ) (Anagnostopoulos & Spanea, 2005), or its revised form the IPQ-R (Costanzo et al., 2011; Rozema et al., 2009). This is a quantitative measure of the five components of illness representation (i.e., identity, consequences, timeline, control/cure and cause) incorporated in the common-sense model of self-regulation of health and illness (Leventhal et al., 1997; Leventhal, Brissette, & Leventhal, 2003; Moss-Morris et al., 2002).

These studies modified the cause scale of the said measure to suit attributions for breast cancer. However, the way this particular scale was modified and the number of items utilized varies between studies. For example, Rozema et al. (2009) used the 18 item cause scale of the IPQ-R and added the item "hormonal" in comparison to Costanzo et al., (2011) study which presented 13 items. In contrast, Lizama et al. (2016) developed a 37 item attribution measure called the Risk Perception Questionnaire (RPQ). Each item of the RPQ was rated as to whether it "increased, decreased, or had no effect on the chance of getting breast cancer." A possible limitation of the RPQ is that it did not specify if respondents should respond according to their beliefs about their own breast cancer or that of other women's breast cancer in general.

In qualitative studies, analysis of causal attributions have been based on responses to open-ended questions included in population-based cancer surveys such as: "Why do you think you got your cancer?" (Ferrucci et al., 2011); "What do you believe caused your cancer?" (Thomson et al., 2014); "Do you believe anything in particular may have contributed to you developing breast cancer?" (Panjari, Davis, Fradkin, & Bell, 2012). Causal attributions for breast cancer were also gathered from a qualitative analysis of focus group discussions or interviews in which women were asked about their experience of breast cancer (Gurm et al., 2008; Kwok & White, 2011; Lam & Fielding, 2003).

There is also variation between studies with regards to how individual attribution items or responses have been classified into broad or condensed categories. For example, Oba et al. (2009) grouped 19 items into two categories, risk factors or conventional/common explanations. Rozema et al. (2009) conducted a principal components analysis (PCA) on the 19 item version of the cause scale of the IPQ-R and obtained three factors; psychological cause, behavioral cause, and biological cause. Anagnospotolous and Spanea (2005) also conducted a factor analysis but, unlike Rozema et al. (2009), included all items of the IPQ (not just the cause scale). A limitation of the use of factor analyses is that the factor solution obtained can be applicable only to the set of data analyzed for each individual study. It is not possible to compare factor structures across studies because factor structures differ. There were also inconsistencies concerning individual items or variables that load on a particular factor and items that were excluded from further statistical analyses because it did not load on a particular factor.

In population-based investigations of causal attributions for cancer, responses have been categorized according to the authors' own classification scheme. The number of categories in these studies ranges from six to ten (Ferrucci et al., 2011; Panjari et al., 2012, Willcox et al.,2011; Thomson et al., 2014). In Thomson et al. (2014) study, attributions for breast cancer were grouped according to six categories namely physiological, environmental, familial, mental/emotional, modifiable/lifestyle, chance. Thomson et al. (2014) reported that only items under the modifiable/ lifestyle category are characterized as controllable.

Taken together, the fact that the studies of causal attributions for breast cancer among affected women have used different methods, particularly in the ways that attributions were measured, suggest that this is a topic that would be appropriate for a systematic review allowing a synthesis of study findings. Appraising and synthesizing literature on breast cancer attributions would help summarize all available data in a concise and comprehensive manner. This may also provide a strategic and systematic way of grouping causal attributions in a consistent manner reflective of past studies on causal attributions for breast cancer.

Furthermore, although risk factors for breast cancer were mentioned in the studies described, there has not been a study which has compared epidemiological risk factors for breast cancer with perceived risk factors for breast cancer cited in attribution literature. An alignment of the findings of a systematic review with empirical evidence on risk factors would highlight potential differences between expert and lay opinions of breast cancer risks and ways that this information can be used to inform health promotion efforts. Findings of a systematic review could also be used to produce a measure which includes attribution items common across studies on lay beliefs about breast cancer causation, as well as risk factors promulgated in epidemiological studies.

This measure could also be administered to both affected and unaffected women, because there are few studies that have compared healthy women's and breast cancer survivors' beliefs about risk factors for breast cancer (Anagnostopoulos & Spanea, 2005; Lizama et al., 2016). An understanding of how risk factors for breast cancer are perceived among affected and unaffected women could help inform tertiary and primary cancer prevention strategies respectively.

In Lizama et al.'s (2016) study, affected and unaffected women are given the same questionnaire and asked to rate each item for their effect "on the chance of getting breast cancer". A possible limitation of this particular study is that it did not specify if affected women were responding to what they think caused their own breast cancer or what they thought caused breast cancer generally. Consequently, it is unclear if affected women make this distinction. Also comparisons between cases and controls might be clearer if the referent under consideration is the same. Unaffected women, by virtue of not having a personal history breast cancer, may be responding to what they think caused other women's breast cancer. Consequently, the extent to which affected and unaffected women's beliefs about illness causation differ may be made clearer if the two samples respond on the basis of the same referent when identifying risk factors.

Causal Attributions and Psychological Outcomes

The literature is also inconsistent with regards to the influence of causal attributions on psychological outcomes. In some studies, affected women who attributed their cancer to internal and controllable factors experienced psychological distress. For example, affected women who attributed their breast cancer to unhealthy lifestyle choices experienced more mood disturbance, poorer quality of life, and experienced anxiety and depression post-diagnosis (Bennett, Compas, Beckjord, & Glinder, 2005; Friedman et al., 2007; Glinder & Compas, 1999). Janoff-Bulman (1992) described this as a type of behavioral "self-blame", in which individuals feel responsible for negative outcomes. Thus, an attribution of causality to factors outside of one's volition may arise from a need to maintain a favorable self-image and self-esteem (Roesch & Weiner, 2001).

In contrast, other studies have shown that attribution to causes that are perceived as uncontrollable, such as stressful life-events or circumstances, is also associated with psychological distress among affected women. Panjari et al.(2012) reported that women who endorsed stress as a contributing factor to their breast cancer reported lower psychological well-being. This suggests that associating the personal experience of cancer to causes that are perceived as uncontrollable may foster a fatalistic attitude impacting expectations for future recovery, and potentially contributing to greater distress (Roesch &

Weiner, 2001). This interpretation of course, assumes that stress is seen as uncontrollable, an interpretation that is debatable.

Notwithstanding these findings, other researchers (e.g., Costanzo et al., 2007; Leventhal et al., 1997;) argue that causal attributions to modifiable risk factors are related to positive affect or adjustment because these can be motivating factors that can drive patients to make necessary behavioral changes. For some women, a belief in potentially modifiable factors as causal to one's illness may foster a greater sense of confidence that their actions can lead to desired outcomes, thus leading to greater sense of well-being (Costanzo et al., 2011; Leventhal et al., 1997; Lowery et al.,1993). There is a link between beliefs about breast cancer risk factors and uptake of health behaviors. However, the association between affective responses to cancer and its potential influence on attribution ascription is less clear. It is of interest to examine the role of cancer attributions in fear of cancer recurrence, which continue to be an important survivorship concern of affected women, alongside health behaviors which could potentially ward off a recurrence.

The personality variable, dispositional optimism, may moderate the relationship between type of self-referent attributions identified for cancer and psychological outcomes such as fear of cancer recurrence and well-being. People with high scores on dispositional optimism are more likely to look forward to good outcomes rather than bad to happen in their future (Carver & Scheier, 2014). This suggests that women can respond positively to their attributions by taking a proactive approach in improving their health, even if they believe that the cause of their cancer was not within their control. In this regard, dispositional optimism may protect women against psychological distress. Those with low optimism may have a more fatalistic attitude towards their recovery or believe they cannot do anything about factors that they believed caused their cancer, a belief which may possibly contribute to greater fear of cancer recurrence and lower well-being (Crist & Grunfeld, 2013; Simard et al., 2013).

In summary, there are documented individual differences in psychological outcomes among women who have experienced breast cancer and it is important for future work to determine to what extent causal attributions play a role in these. It is also important to understand factors that help shape beliefs about illness causation because this would provide useful insight on the type of attributions identified by women, as well as how personality moderates the relationship between attributions and psychological outcomes. Attitudes towards recovery and survivorship of women diagnosed with breast cancer may be at least partly determined by personal beliefs about illness causation.

Other Factors Contributing to the Development of Attributions

Causal attributions are likely to be shaped by the various types of information that has influenced public understandings and beliefs about breast cancer. The media is another source of information that can shape women's causal attributions. For example, a wide range of media formats and outlets were found to focus on human interest stories on affected women who come from high risk families and their experience with prophylactic mastectomies. Inherited/genetic risk such as the *BRCA1* or *BRCA2* was the most referenced risk factors for breast cancer in media outlets, compared to other risk factors such as hormones, diet, even if less than 9.0% of breast cancer cases arise from inherited mutations (Henderson & Kitzinger, 1999). It is likely that in the broader population, there may be less awareness of the link between accumulation of somatic or acquired cellular mutations resulting from environmental exposures and lifestyle behaviors.

Causal attributions may also be influenced by demographic factors. Research suggests that younger cancer survivors are more likely to contemplate the cause of their cancer (Ferrucci et al., 2011; Panjari et al., 2012) and believe that past behavior and environmental pollutants are causal for their own condition compared to those who are older (Wold, Byers, Crane, & Ahnen, 2005). This is not surprising given that cancer is generally viewed as a disease of aging and consequently, young people may need to rationalize their experience in another way. Culture is also another factor which can also influence attributions of causality; those who come from minority groups or non-English speaking backgrounds demonstrate a strong preference for existential or fatalistic causes such as God's will, destiny, or luck (Baider & Sarell, 1983; Gurm et al., 2008; Karbani et al., 2011; Saleh et al., 2012). In addition, affected women could also influence how risk factors for breast cancer are perceived in the broader population as they play an educative role particularly on social media. Their blogs and discussion posts highlight their opinions about breast cancer and are perceived as reliable sources of health information by members of their social network (Quinn et al., 2013).

Outline of Overall Research Aims

Epidemiological studies have highlighted a number of evidence-based risk factors for breast cancer with an emphasis on the role of modifiable lifestyle behaviors in causation (Fraumeni & Schottenfeld, 2006; WCRF/AICR, 2007, 2010). Causal attributions of affected women have been found to influence their health behaviors and psychological responses post-diagnosis (e.g., women who believed that lifestyle causes contributed to the development of their cancer are more likely to follow recommended survivorship health behaviors) (Costanzo et al., 2011). The accuracy of these is therefore critical in assessing the appropriateness of these responses.

The first aim of this thesis, as reported in Chapter 2, is to review published research that has analyzed causal attributions for breast cancer among affected women, and assess how this compares with risk factors identified in published scientific evidence. This review aims to determine the extent to which expert and lay opinion differ on views about breast cancer risk. Results may be used to inform health promotion programs that aim to improve public knowledge and attitudes towards breast cancer risk and prevention.

The causal attribution items identified across studies reported in the systematic review, as well as scientific risk factors for breast cancer, were used to create an attribution checklist questionnaire, Beliefs about Breast Cancer Risk Factors (BBCRF), to assess causal attributions for breast cancer of affected and unaffected women. A comprehensive methodology chapter is presented in Chapter 3 that describes how the BBCRF was developed, as well as other established measures utilized in this thesis. The methods chapter also includes a description of the participants, procedures undertaken to gather data as well as the plan for data analyses.

There is a need to explore factors that help to shape how risk factors for breast cancer are interpreted by women. Attributions can function to preserve a person's self-esteem, particularly when coping with the consequences of an undesirable event such as a diagnosis of cancer (Roesch & Weiner, 2001). As a result, it may be possible that affected women's attributions for their own breast cancer will be different from the attributions they believe cause breast cancer in general. The main aim of Chapter 4 is to investigate if the degree of endorsement of specific risk factors as causal to breast cancer vary according to the referent under consideration by affected women (i.e., self or other). It is hypothesized that affected women will be more likely to attribute the cause of their own breast cancer to anecdotal explanations for breast cancer that are common among affected women than risk factors for breast cancer that have been reported in published evidence.

An understanding of affected and unaffected women's beliefs about breast cancer causality could potentially provide information on how primary and tertiary cancer prevention efforts could be further improved in the broader population. The second aim of Chapter 4 is to explore the extent to which affected women’s degree of endorsement of specific risk factors as causal to breast cancer generally is analogous to population attributions of unaffected women. It is hypothesized that affected women will be more likely to have higher degree of endorsement of specific risk factors as causal to other women’s breast cancer compared to unaffected women. In addition to determining if views about breast cancer causation differ according to the referent under consideration, Chapter 4 also seeks to understand if an individual’s demographic background contributes to potential differences in the degree of endorsement of specific risk factors as causal to their own and/or another women’s breast cancer.

Furthermore, there is a substantial heterogeneity in psychological outcomes among women who have been diagnosed with breast cancer and it is unclear how causal attributions contribute to this variation. The aim of Chapter 5 is to examine the role of attributions on the experience of breast cancer survivorship, specifically the relationship between self-referent attributions and psychological outcomes of affected women. This study utilizes affected women’s degree of endorsement of risk factors that they have for their own breast cancer that was previously reported in chapter 4, to examine the relationship between affected women’s self-referent causal attributions and fear of cancer recurrence (FCR) and psychological well-being. The potential moderating role of optimism is also considered. It is hypothesized that affected women’s endorsement of non-modifiable risk factors as a cause of their own breast cancer will be associated with greater FCR and poorer psychological well-being. It is also hypothesized that higher levels of optimism will reduce distress in the case of affected women who endorse uncontrollable risk factors as causal to their own condition.

Significance of the Study

Causal attributions form a significant part of how people understand and represent their illness (Roesch & Weiner, 2001; Michela & Wood, 1986). For affected women, their attributions may also help elicit meaning in the context of their breast cancer, and help women fit their understanding of the cancer together with restored global meanings or core assumptions that the world is fair, that life is predictable, and that the self is worthy (Park et al., 2008; Park, 2010).

One of the unique features of this research is that it provides a comprehensive review through a comparison of current scientific evidence on epidemiological risk factors for breast cancer with perceived risk factors for breast cancer that have been reported in attribution literature for the past 30 years. A systematic and thorough investigation of expert and lay opinions of breast cancer risks, may inform health promotion activities and programs that aim to improve public knowledge of, and attitudes to, breast cancer prevention and a greater understanding of affected women's survivorship needs.

As breast cancer continues to be the most commonly diagnosed cancer in women, it could be safely presumed that women are likely to have opinions about its causes. This thesis aims to discern differences between the degree of endorsement that women have for specific risk factors as causal to their own breast cancer and probable risk factors for breast cancer generally. It is also of interest to determine if there is a difference between the opinions of affected and unaffected women with regards to their degree of endorsement of risk factors as causal to another women's breast cancer. This would contribute to a deeper understanding of how risk factors for breast cancer are perceived in the broader population, which may be a potentially important precursor to the uptake of health-related behaviors associated with cancer risk.

Another important contribution of this thesis is that it examines the relationships between self-referent causal attributions of affected women and fear of cancer recurrence and psychological well-being. It is important to determine the extent to which causal attributions contribute to psychological sequelae following diagnosis because these have implications for psychological interventions that could help patients cope with breast cancer. Understanding how patients perceive the cause of their own cancer may assist in informing health professionals as they explore with patients their experience of being diagnosed with cancer and possible strategies for managing fear of cancer recurrence, as well as psychological well-being. Therefore, the research presented in this thesis aims to inform future primary and tertiary prevention efforts as well as promote psychological well-being of women with breast cancer

Chapter 2

What Causes Breast Cancer? A Systematic Review of Causal Attributions among Breast Cancer Survivors and how these Compare to Expert Endorsed Risk Factors

Preface:

This study reviews the literature on beliefs of affected women (i.e., women with a previous diagnosis of breast cancer) about the cause of their own breast cancer and contrasts this with expert consensus derived from meta-analyses of various risk factors for breast cancer. It is an area of interest because cancer causal attributions can influence health-related behaviors as well as psychological outcomes. Breast cancer is one of the most common cancers among women, and the opinions of women personally affected can influence how risk factors for breast cancer are perceived in the broader population. Furthermore, comparing cancer survivors' attributions and risk factors for breast cancer reported in scientific literature and documenting the extent to which these differ, can contribute to health promotion programs that aim to promulgate accurate information about breast cancer risk and prevention.

The study in Chapter 2 is presented in the same manuscript form as it was when accepted for publication. The published version of this paper can be found in Appendix C.

Abstract

Purpose: The aim of this paper was to review published research that analyzed causal attributions for breast cancer among women previously diagnosed with breast cancer. These attributions were compared with risk factors identified by published scientific evidence in order to determine the level of agreement between cancer survivors' attributions and expert opinion.

Methods: A comprehensive search for articles, published between 1982 and 2012, reporting studies on causal attributions for breast cancer among patients and survivors was undertaken. Of 5,135 potentially relevant articles, 22 studies met the inclusion criteria. Two additional articles were sourced from reference lists of included studies.

Results: Results indicated a consistent belief among survivors that their own breast cancer could be attributed to family history, environmental factors, stress, or chance. Lifestyle factors were less frequently identified, despite expert health information highlighting the importance of these factors in controlling and modifying cancer risk. This review demonstrated that misperceptions about the contribution of modifiable lifestyle factors to the risk of breast cancer have remained largely unchanged over the past 30 years.

Conclusions: The findings of this review indicate that beliefs about the causes of breast cancer among affected women are not always consistent with the judgment of experts. Affected women did not regularly identify causal factors supported by expert consensus such as age, physical inactivity, breast density, alcohol consumption and reproductive history. Further research examining psychological predictors of attributions and the impact of cancer prevention messages on adjustment and well-being of cancer survivors is warranted.

Keywords: breast cancer, attribution, cause, beliefs

Introduction

Breast cancer is the most frequently diagnosed cancer and the leading cause of cancer death in females. (Ferlay et al., 2015; Ginsburg et al., 2016). Women diagnosed with breast cancer not only have to cope with the physical burden of their condition, but also with psychological comorbidities common among breast cancer survivors such as depression and anxiety. For example, breast cancer patients have described feelings of helplessness and hopelessness, fears of death and dying, and concerns about how their illness would affect their families and their finances (Barraclough, 1999; Hill et al., 2011). Being diagnosed with cancer is life-altering and it may lead people to question beliefs about themselves and the world which leads to a search for causes (Janoff-Bulman, 1992). Asking questions such as “Why did I get this illness?" or “What caused this illness?", may provide a way for cancer patients to understand their situation and any accompanying symptomatology (Roesch & Weiner, 2001).

“Attribution theory” in psychology refers to the process by which people attempt to explain the causes of a particular outcome. Typical categories of causal attributions include the self, other people, heredity, the environment and chance (Michela & Wood, 1986). Weiner (1985, 1986) classified attributions according to three dimensions: locus, stability, and controllability. The locus dimension reflects whether the cause is within (internal) or outside (external) of the person. The stability dimension captures whether causes change over time (i.e., are stable or unstable) and controllability differentiates between causes that are volitional (modifiable) or non-volitional (fixed). In a National Institute of Health study of causal attributions among cancer survivors of the ten most common cancers, Ferrucci et al. (2011) categorized individual causal attributions according to locus and controllability. Each response was condensed into nine broader categories based on the causal attribution literature. These categories were lifestyle, biological, environmental, smoking, chance or bad luck, stress, existential, prior health condition, and psychological. Lifestyle-related attributions such as physical inactivity were coded as internal to the individual and modifiable. By contrast, environmental attributions such as air pollution and occupational hazards were considered external to the individual and fixed or non-modifiable. These characteristics tended to correlate so that internal and unstable attributions such as lifestyle-related factors were considered controllable whereas external attributions were likely to stem from the environment and exhibited lower controllability.

Although causal attributions alone will not predict patients' behaviors and explain the complexity of human actions, attribution theory provides a framework for understanding the cognitions that influence health-related behaviors. Beliefs that people hold with regards to the cause of their own illness influence their decision to seek help, to adhere to medical treatment and their psychological adjustment, during and after treatment (Michela & Wood, 1986; Shiloh, Resenthal, & Benyamini, 2002). Attribution theory also helps explain affective responses to cancer and ways of coping. For example, attributions that focus on uncontrollable causes are related to avoidance coping, whereas attributions that focus on modifiable or controllable causes tend to implicate approach and emotion-focused coping (Roesch & Weiner, 2001). Lykins et al. (2008) reported that, among cancer survivors, a reluctance to cite the influence of personal choices and behavior in cancer causation may serve a self-protective function, proving a way of maintaining self-esteem. This may create a health challenge: cancer patients are at a greater risk than the general population of developing cancer (i.e., secondary malignancies) (Rheingold, Neugut, & Meadows, 2000) and if survivors do not recognize or act on controllable risk factors they may compromise their health risk. Costanzo et al. (2011) demonstrated that cancer survivors' beliefs that lifestyle choice played a role in the development of their cancer appeared to motivate positive changes in health practices following cancer treatment. Since preventive health behaviors are, at least partly, determined by personal beliefs about illness causation (i.e., attributions), an understanding of these causal attributions, and factors that shape these beliefs, is important.

Thirty years ago, when women were asked what caused their own breast cancer, most women identified God, fate, chance, or stress, and exposure to carcinogenic substances (Baider & Sarell, 1983; Taylor et al., 1984). Since then, a number of studies have been conducted on causal attributions for breast cancer among affected women. Results of these studies are less well synthesized but even recent studies indicate that women with a previous diagnosis of breast cancer continue to ascribe their own experience to forces outside of their volition (Ferrucci et al., 2011; Willcox et al., 2011). In contrast, published scientific evidence on risk factors for breast cancer report the importance of modifiable lifestyle behaviors in controlling and modifying cancer risk. Parkin, Boyd, and Walker (2011) estimated that 26.8% of all new cases of breast cancer diagnosed in the United Kingdom in 2010 could be attributed partly to lifestyle factors. Similarly, preventability estimates on breast cancer report that up to 23.0% of (post-menopausal) breast cancer cases can be accounted for by obesity. Physical inactivity accounts for up to 16.5% and alcohol use up to 7.0% of breast cancer cases. The World Health Organization stated that more than 30.0% of cancer deaths could be prevented by modifying or avoiding key behavioral or lifestyle-related risk factors (Bode & Dong, 2009).

This research suggests a mismatch between opinions of affected women as to what caused their own breast cancer and expert views of breast cancer causation, although direct evidence of this mismatch is limited. Documenting the extent of mismatch is important in order to inform prevention programs and to assist in understanding survivor support needs. Breast cancer was chosen as the prototypic cancer site to study because of its multi-factorial etiology, which is characterized by a well-documented hereditary component, and where modifiable lifestyle factors are reported by experts but may be less well understood in the general population (Wang, Miller, Egleston, Hay, & Weinberg, 2010). Previous studies suggest that these distinct viewpoints may be supported by observations that, for affected women, thinking about the possible causes of one's cancer may be driven by emotional processes as opposed to a logical or rational approach (Epstein, 2000). Some research suggests that breast cancer patients who attributed their cancer to behavioral choices experienced negative emotional states and poorer quality of life (Bennett et al., 2005; Friedman et al., 2007). Furthermore, when the cause of one's cancer is associated with lifestyle choices, those affected reported feeling doubly stigmatized; they were stigmatized both by the experience of cancer and their own contribution to its causation (Lebel & Devins, 2008). To a certain extent, non-modifiable causal attributions among survivors can be seen as adaptive. Nonetheless, it is important to document the extent to which these deviate from currently accepted expert opinion. This is because tertiary prevention is at least partly dependent on the adoption of lifestyle choices validated in the scientific literature (Costanzo et al., 2011; Rabin & Pinto, 2006). In addition, survivors' attributions may influence cancer prevention attitudes and behaviors among those in direct contact with them (Willcox et al., 2011). Etiological attributions and consequent response to cancer risk by female relatives are influenced by the subjective experience of breast cancer in the family (Lemon, Zapka, & Clemow, 2004; Rees, Fry, & Cull, 2001).

In the broader population, the media is another factor that shapes understandings of breast cancer causation among women. For example, media coverage of celebrity diagnoses of breast cancer in young women may have led to underestimation of age as a risk factor (MacKenzie, Chapman, Holding, & Stiven, 2010). Similarly, reports focused on personal accounts of affected women with a family history of breast cancer may have influenced views that breast cancer predominantly originates from inherited germline mutations (Henderson & Kitzinger, 1999). Social media, particularly blog posts and discussion posts shared by breast cancer patients themselves, has also become an influential and credible forum for the promulgation of health information (Quinn et al., 2013).

The following systematic review serves to comprehensively summarize literature on beliefs that affected women have about the cause of their own breast cancer and contrasts this with expert consensus derived from meta-analyses of various risk factors for breast cancer. Findings of this study may inform psycho-educational interventions which can help affected women develop accurate and adaptive beliefs about the cause of their breast cancer.

Methodology

Data Sources

The following PubMed, PsycINFO and Web of Knowledge search was conducted on January 25, 2013: (breast cancer OR breast neoplasm) AND (caus*[2] OR attribute* OR belie* OR attitude OR illness representation) AND (patient or surviv*). Papers published in English in the 30 years from January 1982 to December 31, 2012 were considered for inclusion.

Inclusion/Exclusion Criteria

Studies were included in the review if they reported causal attributions or beliefs of breast cancer patients or survivors. The search was limited to studies published in the English language involving women over 18 years of age. This review included both

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[2] *Search term and its derivatives were used (e.g., cause, causes, causal)

quantitative and qualitative studies conducted with inpatients, outpatients, or in community settings. Studies that had a mixed sample (i.e., samples which combined participants with other cancer diagnoses aside from breast cancer) were also eligible for this review provided that there was independent reporting of data for participants who had been diagnosed with breast cancer. Journal articles that did not involve a sample of women who identified causal attributions or beliefs about their breast cancer diagnosis were excluded. Editorials, reviews, opinion papers, and unpublished studies such as dissertation manuscripts were also excluded.

Study Selection

The studies were selected in two steps. Titles and abstracts of all citations identified by the search were screened using the inclusion and exclusion criteria. The full text of potentially relevant articles was then obtained, and reviewed independently by the first author. Reference lists of all included papers were also examined to identify studies not returned via the initial search. The initial search yielded 5,135 journal articles. Based on the titles and abstracts, 5,052 manuscripts were excluded. A total of 83 full text articles were screened and 61 were excluded; 22 studies met criteria for inclusion in this review and 2 relevant articles were sourced from the reference lists of included papers. In total, 24 papers met the inclusion criteria (see Figure 1).

Study Characteristics

Of the 24 included studies, four were conducted in Australia, nine in the USA, one in Canada, two in Israel, two in Hong Kong, and one each in Ethiopia, Greece, Japan, the Netherlands, Sweden, and the UK. The majority of papers meeting inclusion criteria were qualitative studies (*n* = 15, see Table 1). Of these, four made use of mailed or researcher administered surveys with an open-ended question on attributions (i.e., “Why do you think you got your cancer?"). Eight studies utilized a semi-structured interview method and three studies used focus group discussions to elicit responses. Quantitative studies (*n* = 9, see Table 2) asked participants to rate, or select, the cause of their breast cancer from a list of attributions provided by the researcher/s.

Results

A brief summary of published scientific evidence is presented for each risk factor associated with breast cancer followed by the results from the systematic review on the extent to which breast cancer survivors attributed their cancer to the risk factor (including the percentage and corresponding number of women who identified a particular causal attribution in each study). The summaries of published scientific evidence are based on reports from the Australian Institute of Health and Welfare (AIHW, 2012), the World Cancer Research Fund (WCRF/AICR, 2007), the International Agency for Research on Cancer's review of human carcinogens and lifestyle factors (IARC, 2010), and a chapter on breast cancer risk factors from the Breast Cancer: Risk Reduction and Early Detection Strategies textbook (Newcomb & Wernli, 2010). Risk factors or attributions are organized into the following categories: biological, environmental, reproductive history, breastfeeding, and hormones, and lifestyle. Other causal attributions identified but not validated by expert consensus, such as stress, existential influences, previous injury or trauma to the breast, and personality type also reported. Results obtained from the qualitative and quantitative studies are summarized in Tables 1 and 2 respectively.

Biological Attributions

Family history/genetics. Based on established evidence it is estimated that those with a first-degree relative with a history of breast cancer have greater probability of developing breast cancer compared to women without such a history (Newcomb & Wernli, 2010). Risk varies according to the number of relatives with breast cancer and the age at which relatives were diagnosed (AIHW, 2012). Gene linkage studies estimate that the *BRCA1* and *BRCA2* genes, explain between 2.0 and 9.0% of all breast cancers (AIHW, 2012; IARC, 2010;Newcomb & Wernli, 2010;WCRF/AICR, 2007).

In this review, a family history of breast cancer was one of the personal causes most cited by women. Fifteen of the 24 included studies found that most women with breast cancer attributed their own cancer, at least in part, to family history or genetics (Arman, Backman, Carlsson, & Hamrin, 2006; Costanzo et al., 2011; De Ver Dye et al., 2011; Ferrucci et al., 2011; Lavery & Clarke, 1996; Lowery et al., 1993; Oba et al., 2009; Panjari et al., 2012; Rabin & Pinto, 2006; Rozema et al., 2009; Simpson, 2005; Stewart et al., 2001; Taylor et al., 1984; Willcox et al., 2011; Wold et al., 2005). Across the quantitative studies reviewed, the proportion of the sample in each study who reported that family history was a leading or sole cause of breast cancer varied. For example, in Costanzo et al.'s, (2011) study, 70.5% (*n* = 56) of the sample agreed that genetics or heredity was a leading cause. In contrast, Arman et al. (2006) found that only 4% (*n* = 5) of participants believed that heredity was the sole genesis of their cancer. It is important to note that the qualitative studies reviewed also showed that women thought that genetics was a leading causal attribution but not the only cause. For example, when asked about the cause of her breast cancer, one participant said, "First, it may be due to genetics. Second the pressure from the company was too much…therefore they caused the cancer" (Simpson, 2005, p. 676). A similar statement was made by a participant in Arman and colleague's study (Arman et al., 2006, p. 145),"…I have an aunt who also had breast cancer maybe there is something in my genes, but I am pretty sure that it is the contraceptive pill that played a role. It feels like it. …".Therefore, the presence of multiple risk factors may be perceived as significant.

Even though a large number of women identify genetics as a relevant determinant for their cancer, empirical research indicates that less than 9.0% of cases are inherited (AIHW, 2012; Newcomb & Wernli, 2010). This tendency to attribute causation to inherited germline mutations may be influenced by media reports surrounding genetic risk for breast cancer (Henderson & Kitzinger, 1999).

Age. Age is a strong risk factor for breast cancer in women (AIHW, 2012). Newcomb and Wernli (2010) found that the greatest rate of increased risk for breast cancer occurs among post-menopausal women, where risk starts to double with each decade of life up to 80 years of age. In the current review, only two quantitative studies (Costanzo et al., 2011; Rabin & Pinto, 2006) reported age or aging attributions for breast cancer. Neither study reported that age was viewed as a leading cause. Interestingly, more than half of participants (*n* = 42) in Costanzo et al., (2011) study identified aging as a cause. However, this is still a relatively small number of women given the strong link between age and breast cancer.

Breast conditions. High breast density as evident in a mammogram is considered to be one of the strongest risk factors for breast cancer (Newcomb & Wernli, 2010). It is estimated that for women with more than 75% breast density, the risk of breast cancer is four times greater than those with less dense breast tissue. Moreover, women with a history of benign breast disease, who have not been diagnosed with hyperplasia, have a 1.5 fold increased risk of breast cancer compared to women without benign breast disease (Newcomb & Wernli, 2010). Breast conditions were identified as a cause of breast cancer by participants in two studies included in the review, both of which made use of an open-ended survey question (Lavery & Clarke, 1996; Panjari et al., 2012). However, neither study specifically mentioned higher breast density as a cause of breast cancer. In Panjari et al. (2012) breast issues were defined as trauma to breast, abscess, benign lumps, and breastfeeding practices and these factors were identified as causal by 1.7 % (*n* = 26) of women. Lavery and Clarke (1996) included past medical history of benign lumps, mastitis, and breast implants, and these were identified as the cause of breast cancer by 5.0% (*n* = 12) of study participants.

Height. There is scientific evidence that taller height is associated with increased risk of breast cancer especially among post-menopausal women (AIHW, 2012; WCRF/AICR, 2007). Height was not identified as a cause of breast cancer by any of the respondents in the studies reviewed.

Other demographic factors. Women may be at greater risk of breast cancer if they belong to higher socio-economic groups as indicated by level of income and education, as well as geographic locale. This association may also be attributable to the constellation of risk factors that are correlated with high socio-economic status. Caucasian women have a higher risk for breast cancer, followed by African-American women, Hispanic women, and with the lowest rates in Asian women (Newcomb & Wernli, 2010). There were no studies reviewed which identified demographic factors such as socio-economic status, race, level of income and/or education as risk factors for breast cancer.

Environmental Attributions

Environmental factors. Expert evidence suggests that the following environmental risk factors are associated with increased breast cancer risk: exposure to pesticide agents (e.g., dichlorodiphenyltrichloroethane [DDT] and dichlorodiphenyldichloroethylene [DDE]), heavy metal cadmium, and greater exposure to traffic emissions at the time of menarche for pre-menopausal women (Newcomb & Wernli, 2010). Radiation exposure is also classified as a carcinogenic agent with sufficient evidence in humans (IARC, 2010). Expert guidelines indicate that many other aspects of the environment are still being tested.

The results of this systematic review show that causal beliefs relating to environmental factors are prevalent. Affected and unaffected women identify many different kinds of possible environmental causes for their breast cancer. A total of 15 of the 24 studies were reviewed and reported that women with breast cancer believed there was a connection between exposure to environmental toxins and their diagnosis (Anagnostopoulos & Spanea, 2005; Arman et al., 2006; Baider & Sarell, 1983; Costanzo et al., 2011; De Ver Dye et al., 2011; Ferrucci et al., 2011; Lavery & Clarke, 1996; Lowery et al., 1993; Oba et al., 2009; Panjari et al., 2012; Rabin & Pinto, 2006; Stewart et al., 2001; Taylor et al., 1984; Willcox et al., 2011; Wold et al., 2005). In these studies, environmental toxins were defined as actions of other people (e.g., exposure to second-hand smoke), hazards found at the workplace, specific carcinogens, air pollution, exposure to chemical substances, toxic injury, and/or radiation. The number of women who identified environmental factors as a cause of their cancer varied ranged from 1.9% (n = 28) (Panjari et al., 2012) to 73.1% (n = 58) (Costanzo et al., 2011). In studies in which participants rated the strength of various attributions, environmental attributions were not highly rated (Kulik & Kronfeld, 2005; Timko & Janoff-Bulman, 1985). For example, Kulik and Kronfeld (2005) asked participants to rate separately “action of other people” and “occupation” as attributions for their cancer on a scale from 1, indicating little association, to 5, indicating strong causation. Neither was perceived to be strongly linked to breast cancer, with means of 1.84 (SD = 1.07) and 1.49 (SD = 0.92) for “action of other people” and “occupation” respectively. Environmental attributions may also be interpreted in accordance with one’s cultural background. Ethiopian women described their experience of “mich”, or a combination of bad air and sunlight, as a cause of their breast cancer. For example, “The temperature is hot in my village and I usually expose my breast to the sun. I think this is the cause” (De Ver Dye et al., 2011, p. 724).

Reproductive History, Breast Feeding, and Hormones

A number of factors affecting hormonal status have been associated with increased risk of breast cancer; lifetime exposure to estrogen influencing early menarche, having a late natural menopause, not bearing children, a late first pregnancy (over the age of 30), or not breastfeeding are all described by the WCRF/AICR (2007) as breast cancer risk factors with convincing evidence. There is also convincing evidence that hormone replacement therapy increases the risk of breast cancer. Other data indicate oral contraceptives containing both estrogen and progesterone cause a small, transient, increased risk of breast cancer. The International Agency for Research on Cancer (2010) classified diethylstilbestrol, a synthetic nonsteroidal estrogen, and oral contraceptives, as carcinogenic agents with sufficient evidence in humans.

Even though scientific guidelines indicate convincing evidence that lifetime exposure to estrogen increases the risk of breast cancer, this was not widely acknowledged by participants in the studies included in this review. Early menarche was identified as causal by breast cancer survivors in three studies (Oba et al., 2009; Panjari et al., 2012; Rabin & Pinto, 2006). These three studies also identified the decision to delay or not to have children as a cause of breast cancer (Oba et al., 2009; Panjari et al., 2012; Rabin & Pinto, 2006). Oba et al. (2009) found that Japanese women rated never having children more highly than any other cause (*M* = 2.90, *SD* = 1.20), with 70.0% (*n* = 44) of participants attributing their illness to this factor. It is to be noted that Panjari et al. (2012) grouped early menstruation with other factors such as age at menopause and not having children to form a causal category of reproductive cycle and age. Similarly, Oba et al. (2009) combined menstruation with issues regarding past child delivery. Four studies also identified lack of breastfeeding as a causal attribution for breast cancer in some populations (De Ver Dye et al., 2011; Oba et al., 2009; Panjari et al., 2012; Rabin & Pinto, 2006). Ethiopian cancer survivors defined the cause of breast cancer as accumulated milk in the breast, for example “I didn’t lactate after I birthed my first child so milk accumulated, I think this accumulated milk caused breast cancer” (De Ver Dye et al., 2011, p. 725). It is to be observed that Panjari et al. (2012) grouped breastfeeding with other factors such as trauma to breast, abscess, and benign lumps to form the category of breast issues.

Two studies included in the review found that women identified hormones as cause of their breast cancer (Costanzo et al., 2011; Stewart et al., 2001). Breast cancer patients in the Costanzo et al. (2011) study rated hormones as a leading cause of cancer (84.5%, n = 67). Five out of the 24 studies found that women identified hormone replacement therapy as a cause of their breast cancer (Lavery & Clarke, 1996; Panjari et al., 2012; Rabin & Pinto, 2006; Willcox et al., 2011; Wold et al., 2005). In addition, breast cancer patients in six studies included in the review identified oral contraceptive pills as causal (Arman et al., 2006; Lavery & Clarke, 1996; Panjari et al., 2012; Rabin & Pinto, 2006; Willcox et al., 2011; Wold et al., 2005), which was identified by 1.5% (n = 23) (Panjari et al., 2012) to 20.9% (n = 87) (Wold et al., 2005) of women. It is to be noted that Lavery and Clarke (1996) combined oral contraceptive pill with hormone replacement therapy. Willcox et al. (2011) combined hormonal replacement therapy, with vaccination, oral contraceptive, late detection/misdiagnosis, and medication to form the broad causal category of iatrogenic. In total, 13.2% (n = 103) of participants attributed their cancer to this factor. It is also to be observed that in most of the studies in which women attributed the cause of their cancer to reproductive and hormonal factors provided participants with either a checklist or rating scale in which these risk factors were already listed.

Lifestyle

Physical activity. According to WCRF/AICR (2007) there is convincing evidence that physical activity is protective against breast cancer for post-menopausal women. However, for pre-menopausal women there is limited evidence that it is protective against breast cancer. Physical inactivity has also been estimated to be responsible for approximately 10% of breast cancer mortality (WCRF/AICR, 2007). Women in four studies included in the review identified lack of exercise or physical activity as a causal factor (Costanzo et al., 2011; Rabin & Pinto, 2006; Simpson, 2005; Wold et al., 2005).The number of women attributing their cancer to a lack of physical activity ranged from 10.1% (*n* = 42) (Wold et al., 2005) to 38.4% (*n* = 30) (Costanzo et al., 2011).

Diet. Research has evaluated the relationship between dietary factors and breast cancer risk. According to the WCRF/AICR (2007) only a high fat diet has been shown to play a causal role in increasing breast cancer risk among post-menopausal women, however, current evidence remains limited in this area. Eleven out of the 24 studies of women's perceptions identified diet as a causal factor (Arman et al., 2006; Costanzo et al., 2011; De Ver Dye et al., 2011; Lavery & Clarke, 1996; Oba et al., 2009; Rabin & Pinto, 2006; Simpson, 2005; Stewart et al., 2001; Taylor et al., 1984; Willcox et al., 2011; Wold et al., 2005). In these studies, dietary factors included dietary choice or habit, lack of fruits and vegetables in the diet, or too much fat in the diet. Prevalence of attributions for diet as a cause of breast cancer ranged from 1.0% (*n* = 2) (Lavery & Clarke, 1996) to 67.9% (*n* = 54) (Costanzo et al., 2011).

Body size. Although evidence of a link between diet and breast cancer risk has not been consistent or strong (WCRF/AICR, 2007) there is strong and convincing scientific evidence that weight gain in adulthood and abdominal body fat are associated with increased risk for breast cancer, particularly in post-menopausal women (AIHW, 2012).

The International Agency for Research on Cancer (2010) also state that overweight and obesity are responsible for 9.0% of breast-cancer related deaths. The strength of expert opinion contrasts with lay knowledge as represented in the review; only two studies suggested that weight or body size was viewed as causal for breast cancer with 15.9% (*n* = 66) (Wold et al., 2005) and 16% (*n* =10) (Oba et al., 2009) of women partly attributing their breast cancer to being overweight or obese from a list of possible causes of cancer.

Alcohol. There is convincing evidence in humans that the consumption of alcoholic drinks or beverages is a carcinogenic agent that increases breast cancer risk (WCRF/AICR, 2007). The International Agency for Research on Cancer (2010) conclude that consumption of alcohol is responsible for 5.0% of breast cancer-related deaths. The use of alcohol or alcohol consumption was identified as a contributing cause of their breast cancer by women in five studies (Arman et al., 2006; Costanzo et al., 2011; Oba et al., 2009; Rabin & Pinto, 2006; Wold et al., 2005) with the prevalence of this attribution ranging between 6.7% (*n* = 28) (Wold et al., 2005) and 25.0% (*n* = 16) (Oba et al., 2009).

Lifestyle in general. Five studies in this review broadly identified lifestyle or behavioral choices as an attribution linked to cancer causation but did not report specific percentages for specific attributions that fall under this category (Arman et al., 2006; Ferrucci et al., 2011; Panjari et al., 2012; Rozema et al., 2009; Willcox et al., 2011). Ferrucci et al. (2011) found that lifestyle was reported by 49.5% (*n* = 115) of participants as the leading cause of their breast cancer. In contrast, only 0.9% (*n* = 14) of participants in Panjari et al. (2012) attributed their cancer to lifestyle factors. Both studies made use of a cross-sectional survey that posed an open-ended question about causal attributions. It is worth noting that the prevalence differences in these two studies cannot be explained by date (Ferrucci et al. was published in 2011 and Panjari et al. in 2012).

Causal Attributions Identified but Not Validated by Expert Consensus

Stress. There is no scientific evidence that stress is a cause of breast cancer (Michael et al., 2009; Nielsen & Gronbaek, 2006; Surtees, Wainwright, Luben, Khaw, & Bingham, 2010). The review suggests that many breast cancer survivors and patients believe that stress contributes to the development of breast cancer. Despite the lack of evidence that stress causes cancer, 16 studies found that women attributed their breast cancer to their experience of stress (Arman et al., 2006; Ashing-Giwa et al., 2004; Costanzo et al., 2011; Ferrucci et al., 2011; Kwok & White, 2011; Lam & Fielding, 2003; Lavery & Clarke, 1996; Lowery et al., 1993; Oba et al., 2009; Panjari et al., 2012; Rabin & Pinto, 2006; Simpson, 2005; Stewart et al., 2001; Taylor et al., 1984; Willcox et al., 2011; Wold et al., 2005). Moreover, stress was identified as the leading cause of breast cancer in five studies (Lavery & Clarke, 1996; Oba et al., 2009; Panjari et al., 2012; Stewart et al., 2001; Taylor et al., 1984). In a study by Oba et al. (2009) 70% (*n* = 44) of the sample attributed their cancer to stress.

Four out of 16 studies which reported stress-related attributions for breast cancer, specifically defined stress as an inability to cope with a stressful situation, such as relationship conflicts, experience of trauma, dealing with loss or grief, and/or coping with a demanding environment (Costanzo et al., 2011; Kwok & White, 2011; Lavery & Clarke, 1996; Panjari et al., 2012). Some women may rationalize stress as an attribution that is beyond their control. In a qualitative study by Lam and Fielding (2003, p. 133), a Hong Kong Chinese woman described how her separation from her husband led to her diagnosis of breast cancer, “I think that the separation with my husband caused me a lot of emotional distress, which triggered the development of cancer”. In a study by Kwok and White (2011, p. 89), a Chinese-Australian breast cancer patient described her belief about the cause of her breast cancer: “… life is more stressful here compared to living in China, because of the language problem and cultural differences. I believe that's why I got cancer". Two studies included in the review found that those who attributed the cause of their breast cancer to stress also believed that a positive attitude was important in preventing a cancer recurrence (Costanzo et al., 2011) and were more likely to engage in activities such as yoga, meditation, and retreats (Panjari et al., 2012).

Personality. A total of nine studies included in the review found that there were women who believed that their personality caused their breast cancer (Anagnostopoulos & Spanea, 2005; Arman et al., 2006; Ashing-Giwa et al., 2004; Costanzo et al., 2011; Ferrucci et al., 2011; Lowery et al., 1993; Oba et al., 2009; Rozema et al., 2009; Wold et al., 2005). Estimates of the prevalence of this belief ranged from 2.6 % (n = 6) (Ferrucci et al., 2011) to 35.0% (n = 22) (Oba et al., 2009). Unlike stress, which was viewed as external to the self, personality is likely to be seen as an internal characteristic. These women described their psychological disposition as their inability to cope with a stressful situation. They also believed that their internal mental state, such as having a negative mental attitude, feelings of anxiety and depression, or emotional suppression, caused their breast cancer. For example, in a qualitative study, an Asian American shared her views about why she and other women got cancer, "I think that's why we got the cancer. Holding things all the time, worry all the time, worry about many things, small things" (Ashing-Giwa et al., 2004, p. 417).

Existential influences. There is no scientific evidence that existential influences (fate, chance, and/or God's will) are causes of breast cancer. A total of 15 studies reported that affected women viewed these factors as causal to their own breast cancer (Arman et al., 2006; Ashing-Giwa et al., 2004; Baider & Sarell, 1983; Costanzo et al., 2011; De Ver Dye et al., 2011; Ferrucci et al., 2011; Gurm et al., 2008; Kulik & Kronfeld, 2005; Kwok & White, 2011; Lavery & Clarke, 1996; Lowery et al., 1993; Oba et al., 2009; Simpson, 2005; Willcox et al., 2011; Wold et al., 2005). In qualitative studies, participants from non-Western backgrounds were found to endorse fatalistic beliefs about their condition. For example, an Israeli women stated "I never ask any questions, it's better not to know; I have to accept what life brings" (Baider & Sarell, 1983, p. 142) and a Chinese-Australian woman stated "Life is life – if it [cancer] has to happen in your life, you cannot escape it. If it's yours, it's yours" (Kwok & White, 2011, p. 89). Taken together, these studies suggest that fatalistic beliefs about the cause of cancer may serve as a coping mechanism. For breast cancer survivors, seeing their illness as outside their control may also be associated with the way that they accepted their illness.

Attributions may have also been influenced by an individual's religious belief. For example, Baider and Sarell (1983) indicated that those who described themselves as religious were more likely to view their illness as a punishment from God. In a focus group discussion with religious Punjabi women who live in Canada, Gurm et al. (2008) discussed the different meanings associated with an attribution related to God's will. For some women, a strong belief in God's will is what helped them the most with their cancer and enabled positive coping behaviors such as prayers which brought relaxation, peace of mind, and strength. However, for other women, attributing their cancer to God's will meant a predetermined future in which cancer treatments would not be curative. They also expressed the stigma that they felt when a diagnosis of cancer was interpreted as "karma" or punishment for their sins by other people who live in their community. Conversely, Oba et al. (2009) found that Japanese women who did not identify themselves with a particular religion, did not believe God's will was a cause of their breast cancer.

Previous injury or trauma to the breast. In nine out of the 24 studies reviewed, participants cited a 'blow' to the breast or previous injury as a cause of their breast cancer (Costanzo et al., 2011; Ferrucci et al., 2011; Lavery & Clarke, 1996; Oba et al., 2009; Panjari et al., 2012; Rabin & Pinto, 2006; Stewart et al., 2001; Taylor et al., 1984; Wold et al., 2005). The percentage of women who identified this cause of breast cancer was 10.0% or lower except in the case of Costanzo and colleagues (2011) who presented participants with a range of possible attributions (19.3%). It is to be noted that in Ferrucci et al. (2011), trauma or injury was coded under the category of prior health condition. In Panjari et al. (2012) trauma to the breast was included under the broad category of breast issues.

Cancer germs. Despite no established evidence, two studies reported participants who considered cancer to be a germ or contagious virus (Costanzo et al., 2011; Karbani et al., 2011). South Asian women, who resided in the UK, described their beliefs about cancer as a contagious disease, “we don’t even talk loudly about cancer; we whisper when cancer is mentioned or discussed. … might catch it” (Karbani et al., 2011, p. 1622).

Unknown Origins (Don’t Know)

Despite the availability of information on breast cancer risk factors, eleven studies included in the review reported a number of women who indicated that they “don’t know” the cause of their cancer when asked (Arman et al., 2006; Ashing-Giwa et al., 2004; Baider & Sarell, 1983; De Ver Dye et al., 2011; Ferrucci et al., 2011; Kwok & White, 2011; Lowery et al., 1993; Panjari et al., 2012; Stewart et al., 2001; Willcox et al., 2011). It was found that 6 - 57% of women said that they did not know the cause of their breast cancer or declined to give a reason for the development of their breast cancer. This finding may signify that a lack of awareness still exists about breast cancer risk factors, or it may also be possible that breast cancer survivors do not want to think about what may have caused their cancer. Alternatively, women may have knowledge about risk factors for breast cancer in general, but feel confused about the cause of their cancer specifically. For example, one woman was at a loss to explain why she got cancer because she followed healthy lifestyle recommendations, “I watched my food for many years, considered myself very fit, walked 4 miles every day.... I was somewhat angry because I had done all the right things with diet, I didn't drink or smoke" (Ashing-Giwa et al., 2004, p. 417).

Discussion

The findings of this review are consistent with previous literature that indicates beliefs about the causes of cancer may not always be consistent with the judgment of experts (Ferrucci et al., 2011; Slovic, 1987, 2010; Willcox et al., 2011; Wold et al., 2005). Results indicated that the most frequently identified causal attributions among women who have been previously diagnosed with breast cancer are family history/genetics, environmental factors, stress, and chance. Other risk factors with convincing evidence such as aging, reproductive history, and lifestyle factors were not as frequently mentioned, despite the availability of health information on the importance of these factors in reducing cancer risk. The studies in this review encompass a 30-year period and demonstrate that misperceptions about the comparative contribution of modifiable lifestyle factors to the risk of cancer are largely unchanged across this time period.

Results of this review are also consistent with psychometric theories that define aspects of hazards that increase fear (Slovic, 1987, 2010). This includes the controllability domain of a risk attribute whereby a risk variable is considered more significant if a person is unable to control their exposure to that risk (e.g., family history/genetics, environmental factors, stress, or chance). It also draws attention to the importance of affect and feelings in making personal judgments about the causes of breast cancer. For the breast cancer survivors in the included studies, attributions may have been influenced by cognitive dissonance and the need to emotionally distance the self from recriminations and self-blame. Consequently, endorsed attributions would be those that served a protective function or a way to maintain their positive self-image or self-esteem. However, the extent to which lifestyle or modifiable causes of cancer are associated with self-blame remains unclear.

The observed variations in the findings of this review may have been influenced by the methods used to assess attributions across the studies. For example, studies which made use of a checklist of breast cancer risk factors were more likely to have women endorse causal attributions based on scientific evidence including aging, reproductive choices, hormone therapy, lack of physical activity, and drinking alcohol. Moreover, these studies were also more likely to be published recently (between 2005 and 2012), by which time, promotional information about these breast cancer risk factors had multiplied. However, it should be noted that in these studies, evidence-based modifiable factors were still endorsed less often than other non-modifiable factors such as family history or environmental toxins. On the other hand, most of the studies which had "don't know" responses made use of surveys that included open-ended questions about causal attributions. Responses may have been influenced by variations in question wording, especially in qualitative studies which included an open-ended question on attributions. For example, questions asking respondents for events or circumstances which they believed may have contributed to the development of their breast cancer may have prompted stress-related attributions. A question such as "Have you ever asked 'Why me?" about your BC?" is likely to have encouraged metaphysical musings about causation.

Other factors, such as the socio-demographic background of participants in the included studies may have contributed to the variations in attribution prevalence observed. Affected women who are young and educated were found to be more likely to contemplate and search for causal explanations for their cancer (Costanzo et al., 2011; Ferrucci et al., 2011; Panjari et al., 2012). These individuals may have more access to and/or be aware of recent epidemiological studies of risk factors for cancer. Nonetheless, findings of the review suggest a bias for identifying non-modifiable causes even among young and educated participants. In addition, individual differences with regards to the experiences of affected women prior to being diagnosed need to be accounted for. For example, some affected women who reported having a healthy lifestyle prior to diagnosis indicated that they "don't know" the cause of their condition or relied upon attributions which have no expert consensus to explain their illness (Ashing-Giwa et al., 2004; Lam & Fielding, 2003).

It is noteworthy that in studies in which the sample consisted of women from minority groups living in western countries (e.g., Asian women living in Australia (Kwok & White, 2011), or Canada (Gurm et al., 2008), beliefs in fatalistic influences as a cause of cancer were common. Some women also attributed their cancer to the stress and pressures of living in a Western country (Kwok & White, 2011). Although existential attributions are at odds with expert opinion, these beliefs may provide an explanation that is acceptable to women. They may help women rationalize why a seemingly healthy woman gets sick with cancer and may serve as a psychological buffer that aids with life post cancer.

The generalizability of the results presented in this review is limited by the characteristics of the studies included. In Western studies, most participants were Caucasian and well-educated, therefore the attributions of women with less education remain largely unknown. Participants were also found to be similar in terms of breast cancer stage at diagnosis (i.e., stages I and II with no distant metastases) so views of affected women with poorer health status may have been missed. Most of the studies on causal attribution reported the percentage of women identifying or endorsing a particular attribution, and the large variation in sample size between studies included in the review means that proportions vary hugely. It is important to note that findings of quantitative studies included with relatively small sizes should be interpreted carefully, as this presents a small base when percentages are computed.

Notwithstanding these concerns, this review highlights the contrast between causal attributions that affected women have about their own breast cancer and published scientific evidence on breast cancer risk. Results indicated that, despite epidemiological findings on the importance of modifiable lifestyle behaviors in cancer causation, a significant percentage of women continue to ascribe causation to non-modifiable factors and factors with limited or no scientific evidence. This review highlights the need for health promotion and communication efforts to decrease the gap between lay and expert opinion on beliefs about the causes of cancer.

Summary and Recommendations for Future Research

This review revealed that, among breast cancer survivors, there is an awareness of lifestyle influences on breast cancer causation. However, non-modifiable attributions such as family history of cancer, as well as those with no or limited scientific support such as stress, continue to be given greater importance. A number of individuals also provide a “don’t know” response when asked about the cause of their cancer. Addressing possible confusion with regards to cancer causation and identifying the profile of individuals who may need additional support is an important area for future research.

Further studies on psychological predictors of attributions and beliefs about the causes of cancer may also help explain how risks are judged or interpreted. It is important to validate whether over-estimation of non-modifiable factors and/or attributions with limited or no scientific evidence is part of a coping strategy to avoid a sense of blame. The impact of cancer prevention messages on cancer survivors’ psychological well-being remains unclear.

The current review focused exclusively on causal attributions made by women with breast cancer; studying attributions made by men and/or people diagnosed with other cancers would indicate the extent to which these results are generalizable. A comparison of causal attributions and perceived risk factors among cancer survivors, those with a family history, and the general population may also warrant further study. Finally, most studies are either cross-sectional or qualitative in nature, and those that have a longitudinal study design have not examined whether attributions change throughout the cancer journey.

Figure 1.

Search results and inclusion and exclusion of studies

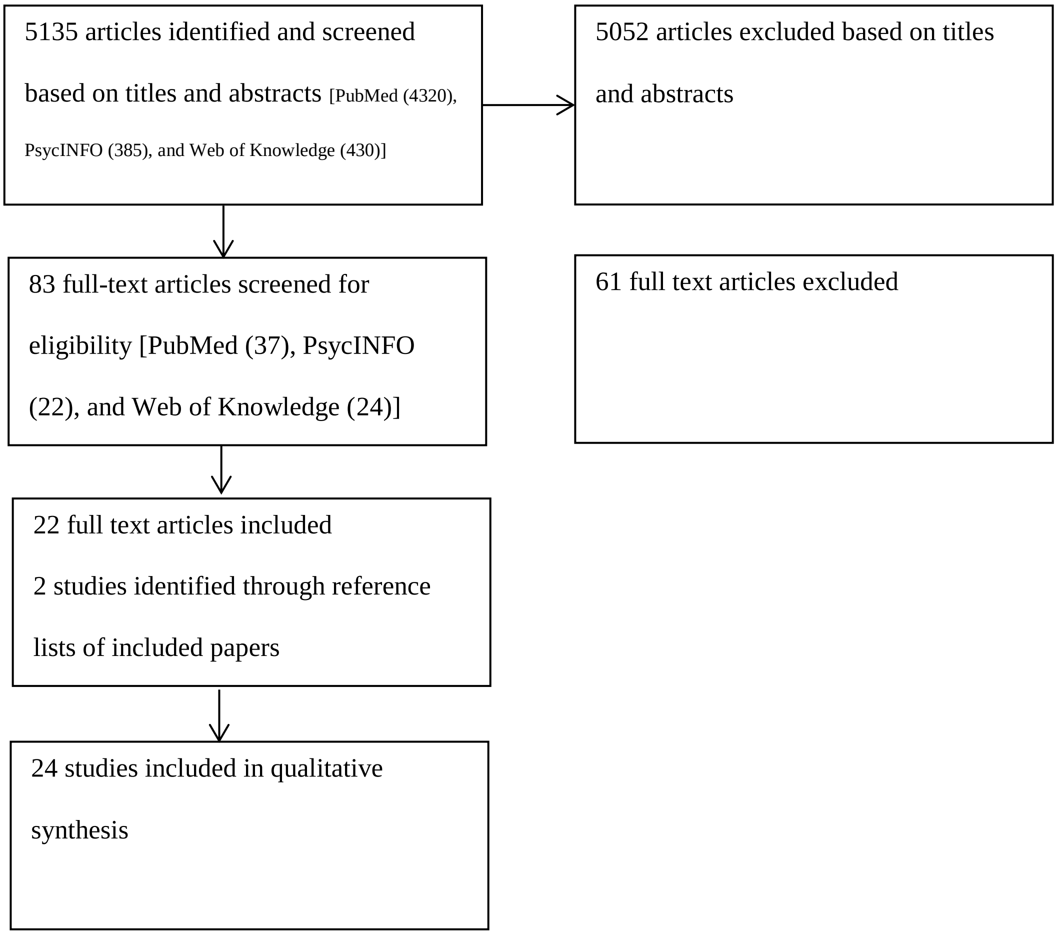

Table 1

Summary of qualitative articles on causal attributions among breast cancer survivors (by year)

First Author (Year, Country)	Study Design	Sample Characteristics	Attribution Measure	Summary of Findings
Ferrucci (2011, USA)	Survey with open-ended question	*n* [a] = 232[b]; age: 55 years and older	ACS-SCS-1: 1. "Why do you think you got your cancer?"	Biological attributions: biological (30.6%) Environmental attributions: environmental (18.6%) Lifestyle attributions: lifestyle (49.5%); smoking (1.3%) Other attributions[c]: stress (11.6%); existential (8.2%), chance/luck (5.6%); prior health condition (3.0%); psychological (2.6%) Don't Know[d]: Did not identify a specific attribution (18.5%)
Panjari (2011, Australia)	Survey with open-ended question	*N* = 1496 [b]; age: 18-75 years	BUPA Study: 1. "Do you believe anything in particular may have contributed to you developing BC?" and 2. "Please tell us which event(s) or underlying circumstance(s) you believe may have contributed to the development of your BC"	Biological attributions: family history/genetic (4.4 %); Environmental attributions: environmental exposure (1.9%) Reproductive history: reproductive cycle/age (1.3%); hormone therapy (5.9%); oral contraceptive pill (1.5%); breast issues (which included trauma to breast, abscess, benign lumps, breastfeeding or not) (1.7%) Lifestyle attributions: lifestyle (0.9%) Other attributions: stressful life events (25.1%); prior illness/disability (0.3%) Don't Know: did not believe that anything in particular contributed to their breast cancer (56.9%)

First Author (Year, Country)	Study Design	Sample Characteristics	Attribution Measure	Summary of Findings
Willcox (2011, Australia)	Survey with open-ended question	*n* [a] = 779 [b]; age: 18+ years	CLEAR questionnaire: “What factors do you believe or suspect contributed to your or your partner’s development of cancer, if any?”	Biological attributions: non-modifiable risk factors (27.5%); biological factors (4.9%) Environmental attributions: involuntary toxic injury (7.8%); radiation (3.6%); domestic exposures (1.5%) Reproductive history: iatrogenic (13.2%) Lifestyle attributions: behavior choices (16.9%); active tobacco smoking (2.6%) Other attributions: stress (26.4%); non-material influences (3.3%) Don’t Know: did not identify a contributing factor (41.5%)
De ver Dye (2011, Ethiopia)	Semi-structured interviews	*N* = 69 (55 patients and 14 proxies); age: mean not specified	Asked what they feel causes BC	Biological attributions: biomedical causes[e] (27.5%); genetics/heredity (14.5%) Environmental attributions: mich[f] or bad air (21.70%); sunlight (11.6%); cold exposure (5.8%); heat exposure (4.3%) Reproductive history: breastfeeding problem (17.40%) Lifestyle attributions: ethnomedical cause[g] (55.1%) poor diet (11.60%) Other attributions: curse (5.8%) Don’t Know: answered “don’t know” (30.4%)

First Author (Year, Country)	**Study Design**	**Sample Characteristics**	**Attribution Measure**	**Summary of Findings**
Karbani (2011,UK)	Semi-structured interviews	*N* = 24; age: mean = 58 years	Lay understanding and beliefs about BC	Other attributions: cultural practices and beliefs about breast cancer include the perception that cancer was contagious (e.g., talking about cancer or using careless words could put one at risk); cancer germs can be spread through sharing of personal items with a cancer patient.
Kwok (2011, Australia)	Focus group interviews	*N* = 23; age: 40-69 years	"What did/does BC mean to you?"	Other attributions: believed mammography was a preventive rather than a diagnostic measure; fatalism; stress and grief Don't Know: women who emphasized their healthy lifestyles, could not explain why they got BC
Gurm (2008, Canada)	Focus group interviews	*N* = 20; age: mean = 53 years	Questions on personal beliefs and understanding about BC	Other attributions: spiritual beliefs provided context for understanding their cancer experience (themes included a positive framework of meaning; passive fatalism; karma)
Arman (2006, Sweden)	Semi-structured interviews	*N* = 118; age: mean = 49 years	"Do you think that there is a connection between the life you live and the diseases you get?"	Biological attributions: "the body itself, with heredity and disposition in combination with external and inner aspects of life." [h] Environmental attributions: external factors: environmental toxins Reproductive history: endocrine drugs (oral contraceptives; estrogen) Lifestyle attributions: diet; tobacco; alcohol

First Author (Year, Country)	**Study Design**	**Sample Characteristics**	**Attribution Measure**	**Summary of Findings**
				Other attributions: inner and psychosocial factors; statement of pure chance Don't Know: "no connection"- rejection of belief in a link; Reflection about possible causes but rejection in own case
Simpson (2005, Hong Kong)	Semi-structured interviews	*N* = 20[i]; age: 35-58 years	Asked where their illness came from	Biological attributions: genetics Lifestyle attributions: diet patterns; lack of exercise and rest Other attributions: stress and emotion; fate
Ashing-Giwa (2004, USA)	Focus group interviews	*N* = 102; age: 31-79 years	Groups discussed attitudes, beliefs, and knowledge about BC	Other attributions: stress Don't Know: women who emphasized their healthy lifestyles, and have no family history of cancer could not explain why they got BC
Lam (2003, Hong Kong)	Semi-structured interviews	*N* = 17 age: 30-65 years	"Please tell me what it was like for you to have BC."	Other attributions: stress Don't Know: women who emphasized their healthy lifestyles, and did not experience distress could not explain why they got BC
Lavery (1996, Australia)	Survey with open-ended question	*N* = 244; age: mean = 56 years	A question relating to whether a causal attribution had been made regarding BC. If causal attribution(s) were made, respondents were then	Biological attributions: family history (13.0%) Environmental attributions: environment (2.0%) Reproductive history pill and hormone replacement therapy (6.0%) Lifestyle attributions: diet (1.0%)

First Author (Year, Country)	Study Design	Sample Characteristics	Attribution Measure	Summary of Findings
			invited to indicate the nature of these beliefs.	Other attributions: stress (34.0%); injury (5.0%); past medical history of benign lumps, mastitis, breast implants (5.0%); chance, luck, God's will (2.0%) Don't know: Did not make a causal attribution (30.0%)
Lowery (1993, USA)	Semi-structured interviews	*N* = 195[b]; age: mean = 53 years	"Have you ever asked, 'Why me?' about your BC?" If yes, "How have you answered that question?"	Biological attributions: heredity (13.6%) Environmental attributions: specific carcinogen (5.6%) Other attributions: chance (33.6%); God (10.4%); stress (4.0%); something about me (3.2%) Don't Know: answered "don't know" (9.2%); did not give a causal attribution (11.5%)
Taylor (1984, USA)	Structured interviews	*N* = 78[j]; age: 29-78 years	Participants asked about their hunch or theory about why they have BC	Biological attributions: heredity (26.0%) Environmental attributions: specific carcinogen (32.0%); Lifestyle attributions: diet (17.0%) Other attributions: stress (41.0%); blow to the breast (10.0%); unspecified other (28.0%) Don't Know: did not give an attribution (5.0%)
Baider (1983, Israel)	Semi-structured interviews	*N* = 33; age: mean = 51 years	"What do you think is the cause of your illness?"	Environmental attributions: others (6%) Internal/Modifiable: yourself (24.0%) Other attributions: fate (70.0%); God (60.6%); illness as a punishment (12.1%) Don't Know: answered "don't know" (6.0%)

Note. Percentages enclosed in parentheses represent the percentage of women identifying or endorsing each attribution

ACS-SCS-I = American Cancer Society's Study of Cancer Survivors-I; BUPA Study = BUPA Health Foundation Health and Well-being after Breast Cancer Study; BC: breast cancer; CLEAR = Cancer Lifestyle and Evaluation of Risk Study.

[a] Small *n* indicates reporting of data for BC patients only but total sample included other cancer types

[b] Percentages were re-calculated to report the entire sample of women with breast cancer who participated in the study

[c] Causal attributions identified but not validated by expert consensus

[d] Don't Know includes participants who did not specify a specific causal attribution for their breast cancer (i.e., those that wrote "I don't know"; those who declined or did not give a response to the open-ended question on what caused their breast cancer or left the open-ended question on what caused their breast cancer blank)

[e] Biomedical cause is a combination of heredity, diet and environment

[f] mich (an Ethiopian ethnomedical category roughly equivalent to bad air)

[g] Ethnomedical cause is a combination of breastfeeding, exposure to cold, sunlight, heat, mich and symptoms acquired through work in the workplace

[h] Involves a combination of biological and other factors

[i] Interviews included family members resulting in a total sample size of 59

[j] Paper does not explicitly state whether percentages report for the whole sample or the 95% of women who made attributions

Table 2

Summary of quantitative articles on causal attributions among breast cancer survivors (by Year)

First Author (Year, Country)	Study Design	Sample Characteristics	Attribution Measure	Summary of Findings
Costanzo (2011, USA)	Longitudinal	*N* = 79; age: mean = 55 years	IPQ –R: with an additional section on causal attributions. Participants rated the importance of factors in causing their cancer on a 5-point scale (responses ranged from not at all important to very important)	Biological attributions: genetics or heredity (70.5%); aging (53.3%) Environmental attributions: environmental toxins or hazards (73.1%) Reproductive history: hormones (84.5%) Lifestyle attributions: diet or eating habits (67.9%); lack of exercise (38.4%); alcohol use (20.6%) Other attributions[a]: stress or worry (54.6%); God's will (43.4%); chance or bad luck (36.8%); mental attitude (28.6%); injury (19.3%); germ or virus (17.1%)
Rozema (2009, Netherlands)	Cross-sectional	*N* = 119; age: mean = 46.8 years	IPQ-R: 19 items assessed causal attributions and these were subjected to a principal components analysis	Biological attributions: biological cause[b] Lifestyle attributions: behavioral cause Other attributions: psychological cause
Oba (2009, Japan)	Cross-sectional	*N* = 63; age: 25-77 years	Checklist: Participants were asked whether they thought any of the items were the cause of their BC, response scale ranged from 1 (do not	Biological attributions [c]: heredity (46%) Environmental attributions [c]: occupation (43%); exposure to chemical substance (10%); air pollution (10%) Reproductive history [c]: never having children (70%); never breast-feeding (16%); issues regarding past child delivery or menstruation (21%)

First Author (Year, Country)	Study Design	Sample Characteristics	Attribution Measure	Summary of Findings
			think so) to 4 (strongly think so).	Lifestyle attributions [c]: dietary habit (57%); alcohol consumption (25%); body size (16%); tobacco (10%) Other attributions [c]: stress (70%); chance (59%); fate (56%); physical fragility (41%); personality traits (35%); God's will (16%); had blow to the breast or got hurt the breast (10%)
Rabin (2006, USA)	Longitudinal	*n*[e] = 61; age: mean = 56 years	Checklist: Participants were asked to select the factors they perceived as having caused their BC	Biological attributions: heredity (47.5%); old age (14.8%); Environmental attributions: pollution in the environment (41.0%); second hand smoke (16.4%) Reproductive history: use of HRT (24.6%); use of birth control (16.4%); delayed childbirth (9.8%); early menarche (9.8%); late menopause (8.2%); history of breastfeeding (1.6%) Lifestyle attributions: unhealthy diet (32.8%); smoking (16.4%); not enough exercise (23.0 %); alcohol consumption (11.5%) Other attributions: stress (45.9%); physical characteristics of body (14.8%); constipation (6.6%); physical injury (4.9%); restrictive clothing (1.6%)
Kulik (Israel, 2005)	Cross-sectional	*N* = 60; age: not specified	Causal Attribution Questionnaire: 23 statements about the causes of BC rated	Other attributions: external fate[d]

First Author (Year, Country)	Study Design	Sample Characteristics	Attribution Measure	Summary of Findings
			on a scale ranging from 1 = not true at all, to 5 = very true	
Anagnostopoulous (2005, Greece)	Cross-sectional	*n*^{e} = 102; age: mean = 55.9 years	IPQ: Participants rated statements on a five-point Likert scale ranging from strongly agree (1) to strongly disagree (5)	Environmental attributions: environmental (such as radiation exposure and chemical substances)^f Other attributions: internal causal attributions (such as personality characteristics and suppression of emotions) ^{f}
Wold (2005, USA)	Cross-sectional	*n*^{e} = 416 age: not specified	Opinion survey: 19 causes rated in terms their own cancer on a scale from (1) definitely causes cancer to (5) definitely does not cause cancer	Biological attributions: genetic factors (53.1%); family history (46.6%) Environmental attributions: environmental pollutants (40.6%); food additives (31.5%); occupation or type of work (10.8%); medical x-rays (8.9%); power lines (3.6%) Reproductive history: hormone replacements (40.1%); oral contraceptives (20.9%) Lifestyle attributions: too much fat in diet (20.7%); lack of fruits and vegetables in diet (16.6%); obesity or being overweight (15.9%); smoking (12.0%); lack of exercise (10.1%); drinking alcohol (6.7%) Other attributions: stress (39.7%); personality (8.7%); God’s will (8.4%); physical injury to cancer area (7.2%); bad luck (6.0%); infection (5.1%)

First Author (Year, Country)	Study Design	Sample Characteristics	Attribution Measure	Summary of Findings
Stewart (2001, USA)	Cross-sectional	*N* = 378[g]; age: mean = 61 years	Questionnaire: Included specific questions about breast cancer cause (questions not provided)	Biological attributions: genetics (22.8%) Environmental attributions: environment (21.7%) Reproductive history hormones (20.4%) Lifestyle attributions: diet (13.2%) Other attributions: stress (36.0%); breast trauma (2.4%) Don't know: Answered "don't know" (14.0%); did not respond to question about the cause of breast cancer (14.8%)
Timko (1985, USA)	Cross-sectional	*N* = 42; age: mean = 53 years	Structured measure: Participants indicated the extent to which factors were a cause of her BC on an 11-point scale (1 = not at all a cause, to 11 = completely a cause)	No attributions had mean rating of 6 or above (indicating endorsement)

Note. Percentages enclosed in parentheses represent the percentage of women identifying or endorsing each attribution

IPQ –R = Illness Perception Questionnaire-Revised; BC: Breast Cancer; IPQ = Illness Perception Questionnaire.

[a] Causal attributions identified but not validated by expert consensus

[b] Only causal dimensions with sufficient alpha were reported

[c] Percentages reflect the number of participants who rated the attribution as 3 or 4 (strongly think so) on a 4 point scale

[d] Only factors with a mean rating of 3 or higher (indicating endorsement of the attribution) reported

[e] Small n indicates reporting of data for BC patients only but total sample included other cancer types or family members

[f] Only factors with a mean rating of 3 or less (indicating endorsement of the attribution) reported

[g] Percentages were re-calculated to report the entire sample of women with breast cancer who participated in the study

Chapter 3

Methods

This chapter describes the participants sampled, the variables examined, the measures administered, procedure undertaken to gather the data, and statistical analyses utilized within this thesis.

Participants

Participants in Chapter 4 were 474 women who completed an online survey related to cancer attributions. Overall, 314 were affected women or women with a previous diagnosis of breast cancer (mean age = 55.22, *SD* = 9.33) and 160 were unaffected women or women without a previous diagnosis of breast cancer (mean age = 50.73, *SD* = 13.01). Affected women completed some additional measures of psychological well-being which are reported in Chapter 5.

Eligibility criteria for affected women included:

1. Females who had been previously diagnosed with breast cancer within the last five years;
2. 18 years old and above; and
3. Able to read and write in English.

Eligibility for participation for unaffected women included:

1. No prior personal history of breast cancer;
2. 25 years old and above[3]; and
3. Able to read and write in English.

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[3] Given the low prevalence of breast cancer before age 25 and to ensure that both samples were comparable in age, it was decided that unaffected women 25 years and over were eligible to participate in the study.

Procedure

Institutional ethics approval was obtained from the Flinders University's Social and Behavioural Research Ethics Committee. The researchers also obtained approval to recruit from the Review and Survey Group of Breast Cancer Network Australia (BCNA).

The study was advertised to both affected and unaffected women through Cancer Council SA, the Flinders Centre for Innovation in Cancer, Cancer Voices, and Flinders University. Permission was obtained to post the study advertisement and participant information sheet on organizations' websites, community noticeboards, or newsletters. The researcher also obtained approval to recruit from members of the Review and Survey Group of Breast Cancer Network Australia (BCNA), which provided a sample of women who reside across Australia. Upon approval, BCNA emailed their members to invite women to participate in the project. Aside from the sources of participants listed above, participants were also asked to forward the study advertisement to other women who fit the eligibility criteria and might be interested in participating.

Participants who were interested in the project were provided with an information sheet and could participate in the study by accessing a link to an online survey. Completion of the online questionnaire was considered informed consent. Overall, 590 potential participants clicked on the link to participate. However, 113 respondents did not answer any or completed less than half of the number of the items in the first part of the survey. There were also three respondents who indicated that they had a previous diagnosis of breast cancer and were below 18 years old. These participants were excluded from the dataset. As a result, the final sample consisted of 474 women (*n* = 314 affected women; *n* = 160 unaffected women). As the study was conducted online, participants had access to the questionnaire by clicking on an html link immediately after they had read the letter of introduction and participant information sheet (see Appendix A). Each participant was briefed on the voluntary nature of this study. They were given the option to withdraw from the study, and/or decline to answer any questions. Each participant was also assured of anonymity and confidentiality as the researcher only has access to de-identified responses. Participants were also informed that only group results would be presented or discussed. Completion of the online questionnaire was considered informed consent.

The researcher was aware of the sensitive nature of the study and the emotional turmoil that participation may have caused participants (e.g., possible emotional trauma associated with their memory of receiving a breast cancer diagnosis). All participants were provided with information on counseling support provided by Cancer Council Australia that they could contact if the questionnaire raised any concerns for them.

Measures

Participant characteristics were gathered using a demographic questionnaire developed by the researcher for the purpose of this study (see Appendix B). All participants were asked to indicate their ethnicity, education level, marital status, smoking status, and whether they had breast cancer themselves or a first degree relative who had had breast cancer. Women who indicated that they had been diagnosed with breast cancer were also asked to indicate the stage of the breast cancer. Categories were local, regional and distant. According to the Surveillance, Epidemiology, End Result (SEER) Summary Stage system (Young, Roffers, Ries, Fritz & Hurlbut, 2001) local stage refers to cancers that are confined to the breast (corresponding to stage I and some stage II cancers in the Tumor Nodes Metastasis (TNM) staging system); regional stage refers to tumors that have spread to surrounding tissue or nearby lymph nodes (generally corresponding to stage II or III cancers, depending on size and lymph node involvement).

Distant stage refers to cancers that have metastasized (spread) to distant organs or lymph nodes above the collarbone (corresponding to stages IIIc and IV).

For the comparison between affected and unaffected women (Chapter 4), all participants completed the demographic information sheet and the Beliefs about Breast Cancer Risk Factors scale (BBCRF). The BBCRF is an attribution checklist questionnaire describing causal beliefs about risk factors for breast cancer and is described in detail below. Affected women completed three additional measures, the Psychological General Well-Being Index (PGWB) (Dupuy, 1984), Concerns about Recurrence Scale (CARS) (Vickberg, 2003) and the Life Orientation Test-Revised (LOT-R) (Scheier, Carver, & Bridges, 1994). Prior to actual data collection, a pilot test was conducted. A printed copy of the BBCRF as well as psychological measures used were administered to two affected women. There were also two unaffected women who participated in the pilot test of the BBCRF. There were no concerns reported regarding the instructions and content of the measures employed.

Beliefs about Breast Cancer Risk Factors (BBCRF)

The BBCRF was created for this thesis and was used to measure the degree of endorsement of specific risk factors as causal to breast cancer. The item pool presented in the BBCRF consists of scientific risk factors for breast cancer as well as lay or anecdotal explanations for breast cancer that have limited or no scientific evidence. Information on risk factors for breast cancer were obtained from scientific publications such as the expert report by the World Cancer Research Fund and American Institute for Cancer Research (WCRF/AICR, 2007; 2010). This report comprehensively documented the link between food, nutrition, physical activity and cancer prevention. The IARC (2010) monographs on the evaluation of carcinogenic risks to humans were used as a reference to summarize potential carcinogens and environmental factors that can increase the risk of breast cancer. Other published materials that were utilized for the present research were the Breast Cancer Risk Reduction and Early Detection textbook which provided an in-depth overview of risk factors for breast cancer (Newcomb & Wernli, 2010) as well as a report from the Australian Institute of Health and Welfare (AIHW, 2012) which provided the most up-to-date information on breast cancer in Australia. Taken together, these resources provided a comprehensive summary of published scientific evidence of risk factors which may increase a woman's chance of developing breast cancer. An item pool of common explanations for breast cancer that have limited or no scientific evidence were also included in the BBCRF. This was derived from a comprehensive search for peer-reviewed journal articles (published between 1982 and 2012) reporting causal attributions for breast cancer among affected women. A systematic review on causal attributions for breast cancer among affected women and how these compare to published scientific evidence is presented in Chapter 2.

A total of 28 items listed on the BBCRF were presented on a 5-point Likert scale, ranging from 1 (strongly disagree) to 5 (strongly agree) (see Appendix B). The 28 items listed on the BBCRF were identical for both affected and unaffected women. Both affected and unaffected women were asked to rate each risk factor in terms of other women’s breast cancer in general, “Please indicate the extent to which you agree that a particular factor increases the chances of a person being diagnosed with breast cancer.” Affected women also responded to each item in relation to their own cancer for each item, “Please indicate the extent to which you agree or disagree that a particular factor may have contributed to your own breast cancer.”

In addition, for affected women only, two open-ended questions were presented. The first question was, “If you would like to, please tell us what factors, you believe may have greatly contributed to the development of your breast cancer, if any?” The second question was, “If you would like to, please tell us what factors, you believe may have greatly contributed to the development of breast cancer in other women, if any?” In the BBCRF version for unaffected women, one open-ended question was presented, “If you would like to, please tell us what factors you believe may have contributed to the development of breast cancer in other women, if any?” Qualitative responses regarding causal attributions are shown in Chapter 4.

Responses on the 28 items of the BBCRF were compared between affected and unaffected women (Chapter 4). In Chapter 5, the relationships between affected women's responses on the 28 items of the BBCRF for their own breast cancer and psychological outcomes were also examined (Chapter 5).

Grouping of Individual Items of the BBCRF

The items of the BBCRF survey can be considered individually. However, they can also be grouped into broader categories consistent with how the items were classified in the systematic review reported in Chapter 2. Following the categorizations in Chapter 2, items were condensed into 5 broad categories, namely “Biological attributions” (family history of breast cancer, aging, greater breast density, history of benign breast conditions, height, race); “Environmental attributions” (air pollution, type of occupation, exposure to pesticides/chemicals, exposures to radiation, exposure to second hand smoke); “Reproductive history, breastfeeding, and hormones” (age at first menstruation, later age at first pregnancy, never having children, not breastfeeding, use of hormone replacement therapy, use of oral contraceptives); “Lifestyle attributions” (being overweight or obese, drinking alcohol, lack of exercise, poor dietary habits), and “Causal attributions identified but not validated by expert consensus" (personality type, fate/destiny, God's plan, previous injury or trauma to the breast). Stress, chance or bad luck, and smoking can also be classified under the category of causal attributions identified but not validated by expert consensus. However, a decision was made to consider these items individually to be consistent with previous literature on causal attributions for cancer (Ferrucci et al., 2011; Wilcox et al., 2011). In addition, as there is less consistent evidence that smoking is specifically linked to breast cancer (IARC, 2012), in comparison to items under the lifestyle attributions category, it was also decided that smoking be considered separately.

Reliability of the BBCRF

In this study Cronbach's α coefficient was applied to examine the internal consistency of the five broader categories of the BBCRF for each of the three datasets obtained for this thesis. The Cronbach's α coefficient was interpreted using the following criteria: Excellent ($\alpha > 0.9$), Good ($0.7 < \alpha < 0.9$), Acceptable ($0.6 < \alpha < 0.7$), Poor ($0.5 < \alpha < 0.6$), and Unacceptable ($\alpha < 0.5$). (Kline, 2000).

The Cronbach's α coefficient for affected women's attributions for their own breast cancer were: biological attributions ($\alpha = .53$), environmental attributions ($\alpha = .83$), reproductive history, breastfeeding, and hormones ($\alpha = .71$), lifestyle attributions ($\alpha = .78$), and causal attributions identified but not validated by expert consensus ($\alpha = .60$).

The Cronbach's α coefficient for each broad category for analysis of attributions for breast cancer in general among affected women: biological attributions ($\alpha = .53$), environmental attributions ($\alpha = .80$), reproductive history, breastfeeding, and hormones ($\alpha = .72$), lifestyle attributions ($\alpha = .80$), and causal attributions identified but not validated by expert consensus ($\alpha = .61$).

In the dataset of attributions for breast cancer among unaffected women, the Cronbach's α coefficient for each broad category for this particular data set were: biological attributions ($\alpha = .53$), environmental attributions ($\alpha = .79$), reproductive history, breastfeeding, and hormones ($\alpha = .85$), lifestyle attributions ($\alpha = .86$), and causal attributions identified but not validated by expert consensus ($\alpha = .62$).

Biological attributions had the lowest Cronbach's α coefficient when compared to other broader categories. This may be due to the fact that the majority of affected and unaffected women frequently endorsed family history and aging as a cause of their own and/ or other's breast cancer in contrast to other biological causes, such as height, which was not endorsed by women despite the empirical evidence linking height with breast cancer (AIHW, 2012; WCRF/AICR 2007). However, a Cronbach's analysis of a "biological" risk factor defined by family history and aging only indicated poor internal consistency. The computed Cronbach's α coefficients were: .31, .42, and .27 for affected women's attributions for their own breast cancer and affected and unaffected women's attributions for breast cancer in general respectively. Therefore it was decided that given the exploratory nature of the study and to be consistent with the systematic review, items under the category biological attributions be retained for analyses despite the low alpha value.

Validity of the BBCRF

The face and content validity of the BBCRF was established in two ways. Face validity refers to an instrument appearing to measure what it intends to measure. Content validity refers to the assessment of the correspondence between the items composing the instrument to ensure that it represents the construct for which it is intended to measure. Both face and content validity involve having an expert or panel (or jury) of experts review the content of the measure (Cottrell & McKenzie, 2011).

First, the list of items in the BBCRF was generated from a systematic review (Chapter 2) of existing studies on causal attributions for breast cancer thereby capturing common lay attributions. The systematic review also used epidemiological studies on risk factors for breast cancer that were published by reputable resources such as American Institute of Cancer Research/World Cancer Research Fund and the International Agency for Research on Cancer to create a list of items that are empirically proven risk factors for breast cancer. Second, items were shown to health professionals who worked in the field of cancer research and were aware of lay and expert consensus on cancer causation. The health professionals agreed that the list of items comprehensively covered risk factors for breast cancer that have been previously cited in scientific literature and popular media.

Measures of Psychological Variables

People's attributions or attempts to assign causes for events have consequences for feelings and behaviors. For affected women, an assessment of the nature of their self-referent attributions may provide an understanding of its psychological consequences. According to Weiner's attribution theory, attributions characterized by a combination of dimensions such as locus, stability, and controllability, are related to cognitive, affective, and behavioral consequences (Roesch & Weiner, 2001; Weiner, 1985, 1986).

For example, affected women who make causal attributions that are classified as internal, unstable, and controllable (i.e., lifestyle related attributions) may have lower fear of cancer recurrence and greater well-being, as these type of attributions are associated with approach coping components of coping (Roesch & Weiner, 2001). Conversely, it may also be that affected women who ascribe to external, stable, uncontrollable causes may experience worse psychological outcomes as attributions characterized by the said dimensions have been found to be associated with avoidance coping components (Roesch & Weiner, 2001).

Applying the cognitive adaption theory of Taylor, Litchman, and Wood (1984), cancer causal attributions also play a role in an individual's psychological adjustment. For affected women, their beliefs about what caused their own breast cancer, may be related to cognitive adaptation processes such as the extent to which they are able to make sense and find meaning in their illness experience, perceive that they are in control of making lifestyle choices that could help decrease the possibility of a cancer recurrence, and maintain self-esteem by being optimistic and finding a positive outcome in their diagnosis. For example, Chechatwala's (2011) qualitative thesis, which examined positive psychological adaption among breast cancer survivors reported that for some affected women, their diagnosis made them realize the need to live a healthier and more balanced life as well as have more meaningful relationships with others, particularly their families. This may also impact their sense of mastery and worth.

The study reported in Chapter 5 examined the relationships between affected women's causal attributions for their own breast cancer and fear of cancer recurrence and psychological well-being. This study also investigated if dispositional optimism moderated the relationship between self-referent attributions identified for cancer and psychological outcomes measured. This would help further explain if affected women's degree of psychological well-being and fear of cancer recurrence, which continue to be important survivorship needs or concerns, would depend in part on the reasons or causal attributions that they give for their own breast cancer, and if a personality variable such as optimism would moderate this relationship.

Below is a description of the psychometric properties of the Psychological General Well-Being Index (PGWB) (Dupuy, 1984), Concerns about Recurrence Scale (CARS) (Vickberg, 2003), and the Life Orientation Test-Revised (LOT-R) (Scheier et al., 1994). These measures were selected because they have been previously administered to affected women and have demonstrated validity and reliability. This will help ensure that measures are appropriate and comprehensible to target population.

The Psychological General Well-Being Index (PGWB) (Dupuy, 1984)

In the current study, psychological well-being was operationally defined as the total score obtained by each participant on the psychological general well-being index

(PGWB; Dupuy, 1984). The PGWB is a 22-item self-report measure that contains six domains: anxiety, depressed mood, positive well-being, self-control, general health and vitality. Sample items include, “How have you been feeling in general?”, “How happy, satisfied, or pleased have you been with your personal life?” For each question, there were six response options ranging from 0 to 5 where 0 was the most negative response for general well-being and the most positive option was 5. In the PGWB, answers to some questions were reverse-scored so that for the score as a whole and for the individual domains, a higher score is better.

Each of the domain scores were created by summing the scores of groups of questions and could take values between 0 and 15, 20 or 25, depending on the number of questions in the domain. The domains were summed to provide a total score which ranged between 0 and 110. For the total score and the domain scores, a higher score was associated with a higher level of well-being. PGWB has been used as a brief epidemiological screening instrument in which the total score is sufficient to measure self-perceived psychological health and well-being (Dupuy, 1984).

In Australia, the PGWB was used in The BUPA Health Foundation Health and Well-being after Breast Cancer Study, which is a prospective cohort study of 1,684 Australian women recruited within 12 months of their first diagnosis and followed for five years (Panjari et al., 2012). Publications emanating from this study all made use of the PGWB in documenting the psychological well-being of women over time, supporting the feasibility and utility of this measure for use with Australian women with breast cancer (Bell et al., 2009; Lijovic et al., 2008; Panjari et al., 2012).

Reliability estimates of the PGWB subscales suggest internal consistency across dimensions (α = .61 to .89, Dupuy 1984). Satisfactory evidence of convergent validity for the PGWB was supported by direct associations with other measures of quality of life such as the 36-Item Short Form Health Survey (SF-36) (*r* = .73; van der Molen et al., 1997) and the General Health Questionnaire (GHQ) (*r* = .71; Badia, Gutiérrez, Wiklund, & Alonso, 1996).

Evidence of discriminant validity for the PGWB was also supported by the inverse relationship between the PGWB and standard indices of mental health, such as the Zung Depression Inventory (*r* = -.75), Hopkins Symptom Checklist (SCL-90) (*r* = -.77) and the Minnesota Multiphasic Personality Inventory (MMPI) (*r*= -.55) (Naughton & Wicklund, 1993).

An estimate of internal consistency of the total score of the PGWB based on the present sample was high ($\alpha = .95$).

The Concerns about Recurrence Scale (CARS) (Vickberg, 2003)

In this study, fear of cancer recurrence was operationally defined as the overall fear of recurrence and was represented by the index score obtained by each participant in the first part of the Concerns about Recurrence Scale (CARS) (Vickberg, 2003).

The first part of the overall fear of recurrence section of the CARS consists of four questions that measure the perceived likelihood of experiencing cancer recurrence, the frequency with which participants think about recurrence, time spent thinking about possible recurrence, and the extent to which thoughts about recurrence are emotionally distressing. Sample items include "How much time do you spend thinking about the possibility that your breast cancer could recur?” and "How much does the possibility that your breast cancer could recur upset you?" Participants responded to each question on a 6-point Likert scale. For example, for the first question of the CARS, participants were given the instruction to circle "1" if they don’t think about recurrence at all or "6" if they think about recurrence all the time. An overall fear of cancer recurrence score was calculated by summing the four items (range = 4-24) with higher scores indicating greater fear of cancer recurrence. Thewes et al. (2012) conducted a critical review of all available fear of cancer recurrence questionnaires and subscales, and measured the quality of the CARS using the Medical Outcomes Trust (MOT) criteria. Compared to other measures on fear of cancer recurrence, the CARS received one of the highest total quality ratings.

There is a high degree of internal consistency for the overall fear of recurrence, or index score, of the CARS ($\alpha = .87$; Vickberg, 2003). Convergent validity for the CARS index score has also been established; it is correlated positively with the intrusion ($r = .64$, p <.001) and avoidance subscale ($r = .50$, p < .001) of the Impact of Event scale (Vickberg, 2003) as well as the anxiety subscale of the Hospital Anxiety and Depression scale ($r = .62$, van den Bueken et al., 2008). There is also a negative association between the index score of the CARS and dispositional optimism ($r = -.39$, van den Bueken et al., 2008).An estimate of internal consistency reliability of the overall fear of recurrence, or index score, of the CARS, based on the present sample was high ($\alpha = .91$).

The Life Orientation Test-Revised (LOT-R) (Scheier et al., 1994)

Dispositional optimism was defined as the total score obtained by each respondent on the Life Orientation Test-Revised (LOT-R) (Scheier et al., 1994). The LOT-R is a 10-item measure (6 target items and four fillers items that are not used in scoring) assessing dispositional optimism, or expectations about positive outcomes in general. Respondents are asked to indicate the extent of their agreement with each of the items, using the following response format: 0 = strongly disagree, 1 = disagree, 2 = neutral, 3 = agree, and 4 = strongly agree. Additional instructions encourage respondents to be as accurate and honest as they can throughout, and to try not to let their response to one statement influence their response to other statements. They are explicitly told that there are no right or wrong answers. Negatively worded items (i.e., Items 3, 7, and 9) are reverse coded before scoring. Responses to these items are then summed with the participant's responses to Items 1, 4, and 10 to compute an overall optimism score. Possible range of total scores is from 0 to 24 with higher scores indicating greater optimism. Reliability estimates for the total LOT-R score suggest an adequate level of internal consistency ($\alpha = .68$ to .78; Colby and Shifren, 2012; Schou et al., 2005; Zenger, Glaesmer, Höckel, & Hinz, 2011). Indications for convergent validity were demonstrated by correlation with the General Life Satisfaction Module ($r = .45$; Glaesmer et al., 2011) and the Function Living Index Cancer Scale ($r = .39$; Colby and Shifren, 2013). Evidence of discriminant validity for the LOT-R was also supported by the negative association between the total score of the LOT-R with the anxiety ($r = -.44$) and depression ($r = -.36$) subscales of the Hospital Anxiety and Depression scale (Colby & Shifren, 2013). An internal consistency estimate of reliability of the total score of the LOT-R based on the present sample was acceptable at $\alpha = .80$.

Data Analyses

Several statistical techniques were employed to analyze quantitative data. All of the statistical analyses utilized version 22 of the IBM Statistical package for the Social Sciences Program (SPSS). They were conducted under the guidance of the supervisory team and with support from the University's statistician.

In Chapter 4, paired and independent samples *t*-tests were utilized to examine if the degree of endorsement of specific risk factors as causal to breast cancer vary according to the referent under consideration by affected women (i.e., self or other) and between samples of affected and unaffected women. In addition, categorical analyses were also employed to investigate if socio-demographic variables such as education and family history of breast cancer contribute to differences in the degree of endorsement (i.e., proportion of agreement that a risk factor is causal to breast cancer) of attributions for their own and/or other women's breast cancer. Participants' responses to the open-ended question about the cause of their own and or other women's breast cancer were analyzed through thematic analysis (Guest, MacQueen, & Namey, 2011).

In Chapter 5, the relationship between self-referent causal attributions of affected women, psychological well-being, fear of cancer recurrence, and dispositional optimism were investigated using Pearson product moment correlation coefficient. A simultaneous multiple regression was also performed between fear of cancer recurrence or psychological well-being as the criterion variable and demographic variables, dispositional optimism, and self-referent causal attributions as predictor variables. Hierarchical multiple regression analyses were used to examine the potential moderating influence of dispositional optimism on the relationship between causal attributions for one's own cancer and fear of cancer recurrence and psychological well-being separately.

Chapter 4

Beliefs about the Causes of Breast Cancer: A Comparison of the Attributions of Women Affected and Unaffected by Breast Cancer

Preface:

This study aimed to determine, in depth, the extent to which the degree of endorsement of specific risk factors as causal to breast cancer differ between samples of affected (i.e., women with a previous diagnosis of breast cancer) and unaffected women (i.e., women without a previous diagnosis of breast cancer), and if affected women's beliefs about breast cancer causation are shaped by the referent under consideration (i.e., self or other). Comparison according to samples and by referent provide the opportunity to address two objectives the impact of personal experience of cancer on attributions and whether affected women evaluate their own experience differently from that of other breast cancer survivors.

The three separate datasets used for analyses in this chapter, 1. personal attributions of affected women for their own condition, 2. attributions of affected women for breast cancer in general (i.e., causes of breast cancer in others) and 3. causal beliefs of unaffected women for breast cancer in general provides a comprehensive understanding of how risk factors for breast cancer are perceived in the broader population.

These findings are relevant to the design of health communication or promotion programs that aim to provide the broader population with accurate information on breast cancer risks. Findings of this study may also help to identify the profiles of women who may need greater support with regards to improving their awareness of risk factors for breast cancer as well as motivation to adopt health behaviors that are important in primary and tertiary cancer prevention.

Abstract

Purpose. This study aimed to examine personal (self-referent) and general (other-referent) attributions for breast cancer within two samples; affected and unaffected women.

Method. Affected (*n* = 314) and unaffected Australian women (*n* = 160) completed a web-based survey that assessed their endorsement of evidence-based and anecdotal explanations for breast cancer. All women rated the extent to which they agreed that a risk factor was implicated in breast cancer causation; affected women provided ratings for their own cancer and breast cancer risk generally. Women were also asked via an open-ended question to specify factors which they believed contributed to the development of their own and/or other women's breast cancer. Causal attributions were also compared by demographic variables.

Results. Findings of the attribution checklist indicated that affected women provided comparatively higher levels of endorsement for biological attributions, environmental attributions, reproductive history, breast-feeding, and hormones, lifestyle, and other causal attributions identified but not validated by expert consensus and smoking as causes of other women's breast cancer than for their own. There was no significant difference for stress which was examined as an individual attribution. The extent of endorsement of risk factors for breast cancer did not vary significantly between affected and unaffected women. A content analysis of affected women's causal attributions for their own breast cancer showed that stress was the most frequently identified. Family history of breast cancer was the most frequently cited cause of breast cancer generally. Some socio-demographic characteristics, specifically family history of breast cancer, aging, educational background and/or previous smoking history were linked to the endorsement of a particular attribution among affected women. In contrast, results of categorical analyses suggest that endorsement of risk factors among unaffected women was not influenced by their personal characteristics.

Conclusions. There is a need to improve awareness of risk factors for breast cancer and support women to make informed lifestyle choices that can potentially reduce their risk. Future work is necessary to better understand how lay beliefs about factors contributing to breast cancer influence attitudes to, and health behaviors implicated in, cancer prevention in the broader population.

Keywords: breast cancer, attribution, cause, beliefs, risk factors

Introduction

Breast cancer remains a major cause of illness and cancer-related mortality among women worldwide (Ferlay et al., 2015; Ginsburg et al., 2016). Breast cancer risk is increased by being female, increasing age, the inheritance of gene mutations associated with breast cancer, and having greater breast density (Newcomb & Wernli, 2010).

Notwithstanding these risk factors, a large body of epidemiologic evidence suggests that, depending on when in her lifespan a woman integrates risk-reduction behaviors, as much as 50–70% of breast cancer can be prevented through primary prevention. Outcomes are optimized when behaviors begin in childhood and adolescence. Examples include maintaining physical activity, reducing weight gain during adult years, and reducing and eliminating consumption of alcohol (Colditz & Bohlke, 2015).

Identifying causal attributions for breast cancer among affected women (i.e., those with a previous diagnosis of breast cancer) and unaffected women in the broader population is important because an individual's attempts to explain the causes of their own and other's illnesses can have an impact on health-related behaviors (Michela & Wood, 1986; Shiloh et al., 2002). In psychology, attribution theory is concerned with exploring how different approaches to the construction of causality are predicted by broad demographic and psychological precursors (Shiloh et al., 2002). Attributions can be made along multiple dimensions including locus of control (i.e., whether the cause is internal or external to the person) and controllability (i.e., whether the cause is volitional or fixed) These dimensions can cluster into an overall pattern of modifiable versus non-modifiable attributions. Modifiable attributions such as lifestyle-related risk factors (e.g., physical activity) are categorized as internal to the individual and within one's control. Non-modifiable attributions are those that are fixed or outside of an individual's control, and can be internal (e.g., family history) or external (e.g., environmental exposures) (Ferrucci et al., 2011).

Comparing Personal with General Attributions: Causal Attributions of Affected Women

A recent systematic review comparing studies that reported affected women's personal attributions for their own breast cancer with scientific evidence on well-established risk factors for breast cancer showed that lay misperceptions about the causes of breast cancer persist (Dumalaon-Canaria et al, Hutchinson, Prichard, & Wilson, 2014). The review highlighted that, among these women, the comparative contribution of modifiable lifestyle factors to the risk of breast cancer continues to be underestimated, despite epidemiological evidence. In reviewing studies published over the past 30 years, the most frequently identified causal attributions among affected women for their own breast cancer are those that are perceived as uncontrollable; family history of cancer, stress (particularly from personal hardships or challenges), and chance or bad luck (Dumalaon-Canaria et al., 2014). Only one of these, family history of cancer, is consistent with current scientific consensus (Newcomb & Wernli, 2010).

For affected women, the personal experience of being diagnosed with breast cancer may have influenced their perception of risks. For example, understating the contribution of lifestyle-related factors in the development of their breast cancer and attributing their own cancer to factors outside their volition may assist adjustment to diagnosis. Conversely, endorsement of lifestyle attributions that reflect on an individual’s past behaviors may exacerbate feelings of self-blame (Bennett et al., 2005; Friedman et al., 2007).

Despite the potential impact of attributions on coping, affected women upon diagnosis commonly search for information about the causes of their breast cancer, utilizing various resources including health professionals, the internet, and other cancer survivors (Loibl & Lederer, 2014; Satterlund, McCaul, & Sandgren, 2003). This raises the possibility that affected women have greater general health knowledge about the causes of breast cancer than the general population. Their views about the causes of breast cancer in others may also be more comparable to risk factors endorsed by scientific experts than their attributions for their own cancer. There is a paucity of literature reporting affected women's beliefs about the factors they believe contribute to the breast cancer of other women and how this corresponds with their attributions for their own condition and scientifically endorsed risk factors. A comparison of personal (i.e., self-referent) and general (i.e., other-referent) attributions among affected women would help provide a deeper understanding of how risks for breast cancer are interpreted by women with a personal experience of cancer. This would also further explain the extent to which affected women make a distinction between the cause of their own cancer and probable risk factors for breast cancer generally.

Comparing Population Causal Attributions - Causal Attributions and Beliefs of Affected and Unaffected Women

In the broader population there is a widespread belief that breast cancer is caused by non-modifiable risk factors such as family history of cancer (i.e., inherited mutations in the affected cells) and environmental pollution (Jones et al., 2011; Rabin & Pinto, 2006; Thomson et al., 2014; Wang et al., 2010). Consistent with models of risk perception, risk factors tend to be considered more significant if a person is unable to control their exposure to the risk (Slovic, 1987, 2010). Furthermore, a diagnosis of breast cancer may be thought of as largely unpreventable, and unaffected women may not be likely to associate past lifestyle choices and outcomes such as drinking alcohol and being overweight or obese as contributing to breast cancer in the population (Marlow, Waller, & Wardle, 2010). Compared to other lifestyle risk factors, more women have endorsed smoking as a risk factor for breast cancer (Jones et al., 2011; Wang et al., 2010), despite the fact that there is currently no clear link between smoking and breast cancer (IARC, 2012). This may reflect the widespread promulgation of anti-smoking messages that link cigarettes with cancer generally, rather than to specific cancer types. In sum, these studies suggest a discrepancy between unaffected women's beliefs about the causes and preventability of breast cancer and published scientific evidence on breast cancer risk.

In previous studies, general causal beliefs of unaffected women about the causes of breast cancer have been compared with self-referent attributions of women with breast cancer (Rabin & Pinto, 2006; Thomson et al., 2014). However, this comparison is confounded by the fact that patients and survivors' knowledge and attitudes are impacted by both exposure to the health system and specific life events (Baum & Posluszny, 1999; Butow et al., 2000; Leydon et al., 2000). The views of the general public, however, are largely based upon health knowledge gathered through the media (Henderson & Kitzinger, 1999). Further research is needed to assess how risk factors for breast cancer generally are interpreted by both affected and unaffected women. The extent to which affected women's degree of endorsement of specific risk factors as causal to breast cancer generally (i.e., other-referent) are similar to population attributions of unaffected women remains unclear.

Moreover, causal attributions for breast cancer among women may also be shaped by their personal or socio-demographic characteristics. For example, Rodríguez et al. (2015) and Wold et al. (2004) compared the endorsement for genetics/heredity as a causal attribution for breast cancer, with the former reporting that women without a family history of cancer were more likely to report genetics/heredity as a causal attribution for breast cancer than women with cancer in their family history, and the latter not finding a significant difference in the comparison of endorsement of genetic factors by family history of cancer. As attributions are associated with psychological adjustment to cancer, as well as the adoption of risk-reducing behaviors, it is important to gain a deeper understanding of the nature of cancer causal beliefs and to be able to identify the profile of women who would endorse a particular or specific type of attribution for their own and other women's illness.

The current study aims to compare attributions for breast cancer causation between women with a previous diagnosis of breast cancer and women who have not had breast cancer. It extends the analysis in the first group to a consideration of personal causation with perceived population risk factors, thereby acknowledging that women may create different views based upon the referent under consideration (i.e., self or other).

Consistent with past research, it is hypothesized that affected women will be more likely to attribute the cause of their own breast cancer to anecdotal explanations that are common among affected women (i.e., stress or chance), than evidence-based explanations for breast cancer. It is also hypothesized that affected women will have greater knowledge about the causes of breast cancer in general, making them more likely to endorse evidence-based risk factors than anecdotal explanations when the focus is on causes of breast cancer in others. In addition, affected women, who have more exposure to oncology expertise, will be more likely to endorse evidence-based explanations for breast cancer in general compared to unaffected women.

Methodology

Participants (*N* = 474) were Australian women aged 25 to 75 years old. Affected women (*n* = 314, mean age = 55.22, *SD* = 9.33) had a breast cancer diagnosis within the last five years (mean time since diagnosis = 2.89 years, *SD* = 1.26). Unaffected women had no personal history of breast cancer (*n* = 160, mean age = 50.73, *SD* = 13.01).

Procedure

Participants were recruited using online advertisements that were posted on noticeboards and websites of cancer organizations and community groups. Those who agreed to be contacted for the study were provided with a secure link to access an information sheet and an online survey. Institutional ethics approval was obtained from the Flinders University's Social and Behavioural Research Ethics Committee and informed consent was obtained from all participants. The researchers also obtained approval to recruit from the Review and Survey Group of Breast Cancer Network Australia (BCNA).

The study was conducted online and participants were provided with an information sheet before they started answering the questionnaire. Each participant was informed of the voluntary and anonymous nature of this study via the information sheet. They were also informed of their rights to withdraw from the study, and/or decline to answer any question at any time should the questionnaire raise any concerns for them. The researcher was aware of the sensitive nature of the study and the emotional turmoil that may be experienced due to the recall of the trauma they experienced when their cancer was diagnosed. Participants were given advice on strategies for accessing counseling sites such as Cancer Council Helpline.

Measures

Demographic and health information. All participants were asked to report their age, level of educational attainment, ethnicity, marital status, and if they were a smoker. They also indicated whether they had experienced breast cancer and if they had any first degree relatives who had been diagnosed with breast cancer. Women who indicated that they had been previously diagnosed with breast cancer were also asked to report their age and stage of breast cancer when they were diagnosed.

Beliefs about breast cancer risk factors. A measure designed to capture beliefs about risk factors for breast cancer was developed for this study. This is composed of two parts. The first part is an attribution checklist, which is composed of 28 items that assessed the participant's level of endorsement of risk factors empirically associated with breast cancer (e.g., being overweight or obese), as well as anecdotal or common lay explanations for breast cancer that have limited or no scientific evidence, (e.g., chance or bad luck).

The item pool of scientific evidence on causes of breast cancer was based on reports from the American Institute of Cancer Research/World Cancer Research Fund, the International Agency for Research on Cancer's review of human carcinogens and lifestyle factors, and a chapter on breast cancer risk factors from the Breast Cancer: Risk Reduction and Early Detection Strategies textbook (Newcomb & Wernli, 2010; IARC, 2010, 2012; WCRF/AICR, 2007, 2010). Common explanations for breast cancer that have limited or no scientific evidence were derived from previous studies on causal attributions for breast cancer (Dumalaon-Canaria et al., 2014). All participants responded to each item on a five-point scale ranging from 1 (strongly disagree) to 5 (strongly agree). Affected women rated each risk factor in terms of their own breast cancer and then again in terms of other women's breast cancer. Unaffected women rated each risk factor in terms of whether the item was a risk factor influencing breast cancer in general.

In the second part of the measure, affected women were asked two open-ended questions. The first question was, “If you would like to, please tell us what factor(s) you believe may have greatly contributed to the development of your breast cancer, if any?” The second question was, “If you would like to, please tell us what factors, you believe may have greatly contributed to the development of breast cancer in other women, if any?” Unaffected women also answered the said second question in their version of the BBCRF as a way of gathering their qualitative responses on factors which they believed contributed to the development of breast cancer in other women.

Analysis

To determine the perceived importance of each risk factor, cross-tabulations were used to indicate the percentage of participants who agreed that a factor was causal to breast cancer (i.e., rated the factor as a 4 “agree” or 5 “strongly agree” that it is a risk factor for breast cancer). Cross-tabulations were done separately for personal attributions of affected women for their own condition, as well as attributions by affected and unaffected women for breast cancer in general.

This study also seeks to compare attributions by demographic factors (age, ethnicity, education, marital status, smoking history, family history of breast cancer, breast cancer stage at diagnosis, and time since diagnosis). These comparisons would help to explain if differences in socio-demographic characteristics among women would bring about differences in the type of attributions endorsed. Categorical analysis was utilized to describe associations between items that were strongly endorsed (i.e., agreed as a cause of breast by more than half of women for their own and other women’s breast cancer) and demographic characteristics. For this analysis, the five-point belief scale of the BBCRF was collapsed into a two-point scale (agree/ strongly agree versus uncertain/disagree to strongly disagree). Demographic variables were also dummy coded: age (young, 49 years old and below, versus 50 years old and above) , ethnicity (Caucasian versus non-Caucasian), education (university versus non-university graduates), marital status (married versus not married), smoking history (smoker or has past history of smoking versus never smoked), family history of breast cancer (has an affected first-degree relative with a previous diagnosis of breast cancer versus no affected first degree relative with a previous diagnosis of breast cancer), breast cancer stage at diagnosis (local versus regional and distance), and time since diagnosis (1 year or less since diagnosis versus greater than 1 year since diagnosis). A Fisher's exact test was utilized because the variables being related has only two levels and there is no relatively even split of the subjects among the levels for a demographic variable such as ethnicity (Morgan, Leech, Gloeckner, & Barrett, 2013). Similar to the paper of Wold et al. (2005), due to the number of associations being tested, a *p*-value of <.01 was regarded as statistically significant.

To allow grouping of multiple related factors, risk factors were also condensed into five broader categories, based on causal attribution literature: "Biological attributions" (family history of breast cancer, aging, greater breast density, history of benign breast conditions, height, race; "Environmental attributions" (air pollution, type of occupation, exposure to pesticides/chemicals, exposures to radiation; exposure to second hand smoke); "Reproductive history, breastfeeding, and hormones" (age at first menstruation; later age at first pregnancy, never having children, not breastfeeding, use of hormone replacement therapy; use of oral contraceptives); "Lifestyle" (being overweight or obese, drinking alcohol, lack of exercise; poor dietary habits); "Causal attributions identified but not validated by expert consensus" (personality type, fate/destiny, God's plan, previous injury or trauma to the breast). It is noteworthy that in adopting "condensed categories" to allow grouping of multiple related factors, an exception was made for "Stress" and "Chance or bad luck" which have both been identified repeatedly as anecdotal or common explanations for breast cancer (Ferrucci et al., 2011; Wilcox et al., 2011). Given the tendency to consider these attributions individually in the literature, a decision was made to remove these from the final category and analyze separately thereby providing scope for comparison with other studies. Smoking was also considered individually because there was less consistent evidence that it is linked specifically to breast cancer in comparison to other risk factors in the lifestyle category (IARC, 2012). A total of eight categories are presented (i.e., 1. biological attributions; 2. environmental attributions; 3. reproductive history, breastfeeding and hormones; 4. lifestyle 5. causal attributions identified but not validated by expert consensus; 6. stress; 7. chance or bad luck; 8. smoking).

Cronbach's α coefficient was calculated for each category and the three separate datasets used for analyses in this chapter, 1. Personal attributions of affected women for their own breast cancer 2. General attributions of affected women for breast cancer (i.e., causes of breast cancer in others) and 3. Population causal attributions of unaffected women for breast cancer in general) (i.e., causes of breast cancer in others) (see Table 1).

The rationale for the use of attribution categories and the corresponding method of summation of items for each category or factor is that this method may be most desirable because the scales used to collect the original data are "untested and exploratory, with little or no evidence of reliability or validity" (Hair et al, 2006, p. 140). DiStefano, Zhu and Mindrila (2009) noted that this approach is generally acceptable for exploratory research.

Table 1

Cronbach's alpha coefficients of the attribution categories of the BBCRF

Rational groupings	**Items**	**Cronbach's α coefficient for personal attributions of affected women**	**Cronbach's α coefficient for general attributions of affected women**	**Cronbach's α coefficient or population attributions of unaffected women**
Biological attributions	Family history of breast cancer Aging Greater breast density History of benign breast conditions Height Race	0.53	0.53	0.53
Environmental attributions[a]	Air pollution Type of occupation Exposure to pesticides and chemicals Exposure to radiation Exposure to second hand smoke	0.83	0.80	0.79
Reproductive history, breast-feeding and hormones	Age at first menstruation Use of hormonal replacement therapy Never having children Later age at first pregnancy Not breastfeeding Use of oral contraceptives	0.71	0.72	0.85

Rational groupings	Items	Cronbach’s α coefficient for personal attributions of affected women	Cronbach’s α coefficient for general attributions of affected women	Cronbach’s α coefficient or population attributions of unaffected women
Lifestyle[b]	Being overweight or obese Drinking alcohol Lack of exercise Poor dietary habits	0.78	0.80	0.86
Other casual attributions[c] identified but not validated by expert consensus	Fate/destiny God's plan Previous injury or trauma to the breast Personality type	0.60	0.61	0.62

Note.[a] There is convincing evidence that exposure to pesticides and radiation are environmental risk factors that are associated with increased breast cancer risk. However, it can also be argued that items listed under the said category such as air pollution can also be placed in the category of causal attributions identified but not validated by expert consensus, as many aspects of the environment that are frequently identified by women across studies on causal attributions for breast cancer are still being tested. However, for the purpose of rational groupings it was decided that all environment-related factors be placed in one category.

[b] According to the WCRF/AICR (2007) only a high fat diet has been shown to play a causal role in increasing breast cancer risk among post-menopausal women, however, current evidence remains limited in this area. For the purposes of rational groups, it was decided that poor dietary habits be listed under the category of lifestyle

[c] Stress, chance or bad luck, and smoking can also be classified under the category of causal attributions identified but not validated by expert consensus. However, a decision was made to consider these items individually to be consistent with previous literature on causal attributions for cancer (Ferrucci et al., 2011; Wilcox et al., 2011).

Using these eight categories paired samples *t*-tests were used to test differences in personal (self-referent) and general (other-referent) causal attributions among affected women. Independent samples *t*-tests were utilized to indicate differences between affected and unaffected women's causal attributions for the general population. A Bonferroni correction was implemented to allow for the large number of comparisons with a resulting $p < .006$ set for statistical significance (.05/8 = .006).

Moreover, the type of attributions endorsed for one's own and other woman's breast cancer may also depend on data collection method used. The use of a structured questionnaire can increase cognitive accessibility of relevant beliefs. This may mean that a greater number of causes will be endorsed by participants when an attribution checklist or rating scale is utilized. On the other hand, the use of open-ended question in eliciting attributions encourages participants to cite causes that can easily be recalled or what comes to mind first, and this may help to highlight beliefs that are most salient (Aday & Cornelius, 2006). The use of both an attribution checklist and an open-ended question format would help to provide a deeper understanding of how risk factors are understood by both affected and unaffected women, as well as prevalence of causal attributions for breast cancer in the broader population.

Responses of participants to the open-ended question about the cause of their own and or other women's breast cancer were analyzed through content analysis. This helped determine the type and frequency of specific causes to which breast cancer was attributed in an open-ended question format. The primary coding technique used by the first author involved manually separating each response into individual attributions. A verbatim example of a response to the open-ended question is "Familial gene six cases of breast cancer in my mother's family, plus a very stressful year." From this statement, two individual primary codes were obtained, namely family history of cancer and stress.

Another verbatim example is “age, family history of cancer, bad luck, overweight.” This statement has four codes, namely aging, family history of cancer, chance or bad luck, and being overweight/obese. Testing for inter-rater reliability was conducted by enlisting an independent researcher to code a subset of responses from 30 participants taken at random (Mean kappa statistic = 84.8%).

Primary codes were also condensed into the same 8 categories used in grouping the 28 items of the BBCRF. These categories were adopted to allow for a comparison of open-ended responses and quantitative ratings. If a particular code did not fit under the broad categories specified, another broad category was developed. A “prior health condition” category was created which included low vitamin D levels and other health issues not assessed as attributions in the questionnaire.

Results

Table 2 summarizes the demographic and health history information of the sample. The demographic characteristics (i.e., education, ethnicity, marital status, smoking history, and first degree relatives with cancer) were comparable between affected and unaffected women. The exception was age and cultural/ethnic background, with data indicating that women who had cancer were older and more likely to be of Caucasian background.

Table 2

Sample characteristics (N=474)

Variables	**Affected women** **(*n* = 314)**	**Unaffected women** **(*n* = 160)**
Age[a] (*M, SD*)	55.2 (9.3)	50.7 (13.0)
Ethnicity[a] *n* (%)		
Caucasian	306 (97.5 %)	137 (85.6%)
Asian	3 (1.0%)	21 (13.1%)
Indigenous Australian	5 (1.6%)	2 (1.3%)
Education *n* (%)		
University education	180 (57.3%)	101 (63.1%)
TAFE or technical education	77 (24.5%)	24 (15.0%)
Secondary school	57 (18.2%)	35 (21.9%)
Marital status *n* (%)		
Married	203 (64.6%)	97 (60.6%)
Separated	39 (12.4%)	20 (12.5%)
De-facto relationship	29 (9.2%)	24 (15.0%)
Single/never married	42 (13.4%)	19 (11.9%)
	(missing data *n* = 1)	
Smoking status *n* (%)		
Previous history of tobacco smoking	99 (31.5%)	55 (34.4%)
No previous history of tobacco smoking	215 (68.5%)	98 (61.25%)
		(missing data *n* =7)
Family history *n* (%)		
First degree relative diagnosed with breast cancer	71 (22.6%)	33 (20.6%)
No first degree relative diagnosed with breast cancer	237 (75.5%)	125 (78.1%)
	(missing data *n* = 6)	(missing data *n* = 2)
Breast cancer stage [b] *n* (%)		
Local	87 (27.7%)	
Regional	176 (56.1%)	
Distant	39 (12.4%)	
(missing data *n* = 12)		
Time since diagnosis (*M, SD*)	2.9 (1.3)	N/A

Note. [a]No statistically significant differences were found between affected and unaffected women, with the exception of age and ethnicity with data indicating that women who had cancer were older and more likely to be of Caucasian background. However, effect size was small.

[b]According to the SEER Summary Stage system (Young et al., 2001), local stage refers to cancers that are confined to the breast (corresponding to stage I and some stage II cancers in the TNM staging system); regional stage refers to tumors that have spread to surrounding tissue or nearby lymph nodes (generally corresponding to stage II or III cancers, depending on size and lymph node involvement). Distant stage refers to cancers that have metastasized (spread) to distant organs or lymph nodes above the collarbone (corresponding to stages IIIc and IV)

Attributions for Own Breast Cancer among Affected Women

The majority of women with breast cancer (61.5%) agreed or strongly agreed that stress was implicated in their own breast cancer. Other endorsed attributions were chance or bad luck (58.3%) and aging (53.8%). About a quarter of affected women attributed their breast cancer to the environment (e.g., exposure to radiation), lifestyle factors (e.g., drinking alcohol), and breast issues (e.g., greater breast density). Around 10% to 20% of women attributed their breast cancer to smoking, poor dietary habits, and later age at first pregnancy (Table 3).

Categorical analysis was used to describe the demographic profile of women who agreed that stress, chance or bad luck, and aging were causal to their own condition. Women without an affected first degree relative with breast cancer were more likely to agree that chance or bad luck caused their own breast cancer compared to women without a first degree relative (62.6 versus 43.7%; *p* = .006). Affected women who are 50 years old and above agreed more that aging caused their own breast cancer compared to younger women (65.4 versus 20%, *p* <.001).

Attributions for Others' Breast Cancer among Affected Women

Affected women reported a somewhat different pattern of results for causes of breast cancer generally (other-referent). In this context, the majority identified family history (74.5%), aging (68.5%), stress (58.9%), and smoking (55.7%) as causes of breast cancer in others (Table 2). Slightly more than half of women agreed that breast cancer, in general, is caused by being exposed to pesticides/chemicals and radiation, use of hormone replacement therapy, being overweight or obese. Slightly less than half linked getting breast cancer in general to modifiable lifestyle behaviors such as drinking alcohol and lack of exercise. About a quarter of affected women agreed that breast cancer in others is caused by breast issues such as greater breast density and reproductive factors such as later age at first pregnancy (Table 3).

Items that were endorsed by around half of affected women, as risk factor for another women's breast cancer, namely family history of cancer, aging, exposure to pesticides/chemicals, exposure to radiation, use of hormonal replacement therapy, being overweight or obese, smoking, chance or bad luck, and stress were chosen as attribution variables in the categorical analyses. Result show that affected women who obtained a university qualification were more likely to attribute aging as a cause of breast cancer in others than those who did not complete university education (80.6 versus 53.0%; p <.001). They were also more likely to hold the belief that the use of hormone replacement therapy (60.1 versus 44.1%, $p = .006$) and being overweight or obese (73.3 versus 46.3%. p <.001) contributed to the development of breast cancer in other women compared to non-university graduates. Affected women without a smoking history were more likely to endorse smoking as a cause of breast cancer in others than those who are current or past smokers (64.2% versus 37.4% versus p <.001).

Attributions for Others' Breast Cancer among Unaffected Women

Almost all women without breast cancer agreed that a diagnosis of breast cancer can be attributed to family history of cancer (95.7%, Table 3), followed by smoking (65.0%) and exposure to radiation (64.4%). Similar to beliefs of affected women, more than half of women without breast cancer also agreed that stress is a risk factor (59.4%). Exposure to pesticides/chemicals, (59.4%), aging (51.3%), and use of hormone replacement therapy (50.7%) were also endorsed by more than half of women. These items were used in categorical analyses and results obtained show that there was no significant difference in proportions stratified by demographic variables for unaffected women. This may mean that endorsement of risk factors among unaffected women may not be influenced by their personal background.

Table 3

Participants' mean ratings and percentage of agreement of causal attributions and beliefs for breast cancer

Item	**Personal attributions of affected women**			**General attributions of affected women**			**Population attributions of unaffected women**		
	%Agree to Strongly Agree	***M***	***(SD)***	**%Agree to Strongly Agree**	***M***	***(SD)***	**%Agree to Strongly Agree**	***M***	***(SD)***
Biological attributions									
A family history of cancer	35.60	2.87	1.46	74.50	3.91	1.01	95.70	4.59	0.60
Aging	53.80	3.21	1.28	68.50	3.71	1.06	51.30	3.49	1.06
Greater breast density	28.00	2.98	1.10	28.30	3.12	0.90	11.90	2.76	0.80
History of benign breast conditions	24.80	2.67	1.17	27.70	3.13	0.81	33.80	3.13	0.82
Height	2.20	1.75	0.87	3.50	1.90	0.92	2.50	1.76	0.80
Race	8.60	2.27	0.97	23.60	2.76	1.02	19.40	2.56	1.03
Environmental attributions									
Air pollution	16.80	2.58	1.06	22.30	2.76	1.05	20.70	2.83	0.95
Type of occupation	20.30	2.55	1.14	29.00	2.91	1.04	29.40	2.84	1.04
Exposure to pesticides/chemicals	35.00	3.08	1.12	52.20	3.54	0.93	59.40	3.72	0.86
Exposure to radiation	24.80	2.79	1.13	52.50	3.53	0.90	64.40	3.79	0.89
Exposure to secondhand smoke	21.60	2.73	1.04	38.20	3.22	0.96	44.40	3.39	0.91
Reproductive history, breastfeeding and hormones									
Age at first menstruation	16.00	2.73	0.91	23.60	3.01	0.86	23.80	2.97	0.93
Use of hormonal replacement therapy	23.50	2.47	1.32	54.50	3.61	0.90	50.70	3.56	0.92
Never having children	17.20	2.22	1.19	31.50	3.01	1.04	31.30	2.96	1.16
Later age at first pregnancy	12.70	2.32	1.05	23.60	2.96	0.88	23.70	2.99	0.89

Item	**Personal attributions of affected women**			**General attributions of affected women**			**Population attributions of unaffected women**		
	%Agree to Strongly Agree	***M***	***(SD)***	**%Agree to Strongly Agree**	***M***	***(SD)***	**%Agree to Strongly Agree**	***M***	***(SD)***
Not breastfeeding	11.40	2.15	1.11	29.30	2.98	1.03	31.90	2.98	1.07
Use of oral contraceptives	25.40	2.82	1.07	30.60	3.21	0.96	37.60	3.22	0.94
Lifestyle									
Being overweight or obese	22.00	2.39	1.23	51.00	3.43	0.98	46.30	3.36	1.04
Drinking alcohol	26.10	2.62	1.19	46.80	3.33	0.94	41.20	3.26	0.99
Lack of exercise	20.40	2.38	1.16	46.10	3.33	0.98	36.30	3.17	0.99
Poor dietary habits	15.90	2.31	1.11	45.50	3.31	0.98	45.70	3.33	1.01
Causal attributions identified but not validated by expert consensus									
Fate/destiny	24.80	2.56	1.29	19.50	2.51	1.23	16.30	2.28	1.18
God’s plan	11.50	2.05	1.19	9.00	2.02	1.15	7.50	2.00	1.08
Previous injury or trauma to the breast	19.80	2.52	1.16	22.60	2.90	0.92	36.30	3.11	0.94
Personality type	14.30	2.21	1.14	11.50	2.24	1.08	16.30	2.18	1.14
Stress[a]	61.50	3.63	1.25	58.90	3.62	1.07	59.40	3.66	1.05
Smoking[a]	17.20	2.15	1.27	55.70	3.60	0.96	65.00	3.74	0.98
Chance or bad luck[a]	58.30	3.49	1.27	51.60	3.38	1.19	38.80	2.99	1.29

Note. [a]Attributions considered individually

Comparing Personal and General Attributions: Causal Attributions and Beliefs of Affected Women

Results of paired samples *t*-tests indicated significant differences in personal and general causal attributions among affected women. As shown in Table 4, affected women indicated greater endorsement of biological attributions, environmental attributions, reproductive history, breast-feeding, and hormones, lifestyle, and the individual attribution, smoking, as causes of other women's breast cancer than for their own condition.

In contrast, mean scores for chance or bad luck were slightly higher for their own condition compared to their attributions for breast cancer in general. However, the magnitude of the differences in the means for chance or bad luck (mean difference = 0.11, 95% CI: = -0.07 to 0.08) was small (Cohen's *d* = 0.18). A small effect size could also be observed when mean scores for causal attributions identified but not validated by expert consensus were compared (Cohen's *d* = 0.28). Furthermore, there was no significant difference in the extent to which stress was endorsed by affected women as a risk factor of their own and other women's breast cancer.

Table 4

Paired samples t-test comparing personal with general causal attributions of affected women

Variables	Affected women on causes of own cancer (*n* = 314)		Affected women on causes of cancer in general (*n* = 314)							
	M	*SD*	*M*	*SD*	*t* (313)	*p*	Mean difference	Cohen's *d*	Lower	Upper
Biological attributions *	2.71	0.64	3.09	0.52	-13.82	0.000	-0.38	0.78	-0.44	-0.33
Environmental attributions*	2.75	0.85	3.19	0.73	-13.24	0.000	-0.45	0.75	-0.51	-0.38
Reproductive history, breastfeeding and hormones*	2.45	0.72	3.13	0.64	-18.30	0.000	-0.68	1.03	-0.75	-0.60
Lifestyle*	2.43	0.91	3.35	0.82	-18.90	0.000	-0.92	1.07	-1.02	-0.83
Other causal attributions identified but not validated by expert consensus*	2.34	0.81	2.42	0.74	-4.98	0.000	-0.08	0.28	-0.12	-0.05
Chance or bad luck*	3.49	1.27	3.38	1.19	3.18	0.002	0.11	0.18	-0.07	0.08
Smoking*	2.15	1.27	3.60	0.96	-18.46	0.000	-1.45	1.04	0.04	0.18
Stress	3.63	1.25	3.62	1.07	0.17	0.867	0.01	0.01	-1.60	-1.29

Note. *Bonferroni's correction set the significance level at $p < .006$

Comparing Population Attributions: Causal Attributions and Beliefs of Affected and Unaffected women

As shown in Table 5, results of independent samples *t*-tests showed that there were no significant differences between affected and unaffected women's mean scores for biological attributions, environmental attributions, reproductive history, breastfeeding, and hormones, lifestyle attributions, or causal attributions identified but not validated by expert consensus. The individual attributions smoking, and stress as causal to another women's breast cancer did not vary between the two sample groups. Only one difference reached significance. Affected women had higher mean scores for chance or bad luck as causal to another women's breast cancer (*M* = 3.38, *SD* = 1.19) than unaffected women (*M* = 2.99, *SD* = 1.29; *t*(472) = 3.33, *p* <.001; Hedges' *g* = 0.32). However, a small effect size for this comparison was observed.

Table 5

Independent samples t-tests comparing population attributions of affected and unaffected women

Variables	Affected women (*n* = 314)		Unaffected women (*n* = 160)						95% CI	
	M	*SD*	*M*	*SD*	*t*	*p*	Mean difference	Hedges's *g*	Lower	Upper
Biological attributions	3.09	0.52	3.05	0.47	*t*(472) = 0.88	0.379	0.04	0.08	-0.05	0.14
Environmental attributions	3.19	0.73	3.31	0.68	*t*(472) = -1.71	0.088	-0.12	0.17	-0.06	0.16
Reproductive history, breastfeeding and hormones	3.13	0.64	3.11	0.75	*t*(277.85) = 0.25	0.796	0.02	0.02	-0.12	0.15
Lifestyle	3.35	0.82	3.28	0.86	*t*(472) = 0.87	0.384	0.07	0.08	-0.09	0.23
Other causal attributions identified but not validated by expert consensus	2.42	0.74	2.39	0.75	*t*(472) = 0.37	0.713	0.03	0.04	-0.11	0.17
Chance or bad luck*	3.38	1.19	2.99	1.29	*t*(472) = 3.33	0.001	0.39	0.32	0.16	0.63
Smoking	3.60	0.96	3.74	0.98	*t*(472) = -1.48	0.141	-0.14	0.14	-0.32	0.05
Stress	3.62	1.07	3.66	1.05	*t*(472) = -0.40	0.688	-0.04	0.04	-0.24	0.16

*Note***.** *Bonferroni's correction set the significance level at p < .006

Results of Content Analysis of Open-Ended Responses

Table 6 presents the results of content analysis of open-ended responses, sample quotes, and frequency of causal attributions. Approximately 90% of affected women answered the open-ended question on factors they believed contributed to their own breast cancer ($n = 271$) and the breast cancer of other women ($n = 272$). Approximately 70% of unaffected women gave an answer to the question ($n = 114$).

Among affected women, biological attributions ($n = 113$, 41.70%) and stress ($n = 109$, 40.22%) were the most frequently identified causes which may have possibly contributed to their own condition. Some women described their family history of breast cancer, such as the number of women who have been previously diagnosed with breast cancer in their family. There were also some women who specified stressful circumstances such as relationship conflicts (e.g., “significant shock in my marriage causing stress"), work-related stress (e.g., "high levels of stress at work"), bereavement issues (e.g., mother’s illness and death), and calamities (e.g., stress caused by flooding events), as possible factors which may have contributed to their own cancer. Reproductive history, breastfeeding, and hormones was the third most frequently identified attribution category ($n = 87$, 32.10%). Results also showed that affected women identified other items that can be categorized under reproductive attributions, such as abortion and in-vitro fertilization, despite the lack of scientific evidence linking the said risk factors to breast cancer specifically (Gennari et al., 2015; Guo et al., 2015).

When affected women were asked about factors which they believed caused another woman's breast cancer, biological attributions ($n = 153$, 56.25%), stress ($n = 85$, 31.25%), and lifestyle ($n = 81$, 29.78%) were the most frequently mentioned causes. For unaffected women without a previous diagnosis of breast cancer, biological attributions ($n = 103$, 90.35%) was the most frequently mentioned cause of breast cancer.

Table 5

Content analysis of open-ended responses: Causal attribution categories, sample quotes, and frequency of causal attributions

	Factors which affected women believe may have contributed to the development of their own breast cancer (*n* = 271)[a]			Factors which affected women believe may have contributed to the development of another woman's breast cancer (*n* = 272)[a]			Factors which unaffected women believe may have contributed to the development of another woman's breast cancer (*n* = 114)[a]		
		n	%[b]		*n*	%[b]		*n*	%[b]
Biological attributions	Family history of cancer /hereditary/genetics (e.g., "six cases of BC in mother's family”)	66		Family history of cancer /hereditary/genetics (e.g., “genetic predisposition”)	106		Family history of cancer /hereditary/genetics (e.g., “history of family members with breast cancer”)	92	
	Aging	23		Aging (e.g., “being over 50”)	37		Aging	8	
	Being female	2		Being female	4		Being female	2	
	Breast density	11		Benign breast condition (e.g., “abnormal cell growth LCIS”)	4		Breast density	1	
	Benign breast conditions (e.g., “benign lumps”)	11		Dense breast (e.g., “more dense breast tissue”)	2				
	Total biological attributions	113	41.70	**Total biological attributions**	153	56.25	**Total biological attributions**	103	90.35
Environmental attributions	Exposure to chemicals/pesticides (e.g., "chemicals in food")	20		Exposure to chemicals/pesticides (e.g., “chemicals in the world/food”)	24		Exposure to chemicals/pesticides (e.g., “chemicals in food”)	5	
	Exposure to radiation (e.g., “X-ray radiation; microwaves”)	19		Exposure to radiation (e.g., “exposure to electromagnetic radiation”)	6		Use of plastics	1	
	Occupational factors (e.g., "shift work")	10		Exposure to pollution (e.g., “pollutants in the environment”)	4		Pollution	1	
	Exposure to secondhand smoke (e.g., "living with smoker")	4		Occupational factors (e.g., “shift work”)	2				
	Consumer products (e.g., " deodorant; plastic bottles")	4		Exposure to secondhand smoke (e.g., “exposure to smoke from cigarettes”)	1				

	Factors which affected women believe may have contributed to the development of their own breast cancer (*n* = 271)[a]			Factors which affected women believe may have contributed to the development of another woman’s breast cancer (*n* = 272) [a]			Factors which unaffected women believe may have contributed to the development of another woman’s breast cancer (*n* = 114) [a]		
		n	% [b]		*n*	% [b]		*n*	% [b]
	Exposure to pollution (e.g., "lived in a polluted city")	1		High voltage lines	1				
				Use of plastics	1				
	Total environmental attributions	58	21.40	**Total environmental attributions**	39	14.34	**Total environmental attributions**	7	6.14
Reproductive history, breastfeeding, and hormones	Hormonal replacement therapy (e.g., "on HRT")	19		Hormonal replacement therapy (e.g., "HRT")	29		Hormones (e.g., “hormones nature or artificial”)	8	
	Hormones (e.g., "hormone imbalances")	15		Hormones (e.g., "too much estrogen")	13		Oral contraceptives (e.g., “pill”)	1	
	Nulliparity (e.g., "no children")	10		Oral contraceptives (e.g., "pill may well increase a predisposed chance of breast cancer")	12		Lack of breastfeeding	1	
	Oral contraceptives (e.g., "prolonged use of OCP")	10		Later age at pregnancy (e.g., "later age at first pregnancy")	8				
	Early menarche (e.g., "early periods")	7		Menopausal concerns (e.g., "menopause so severe")	3				
	Later age at pregnancy (e.g., "late baby at 41 years")	6		Nulliparity (e.g., "women’s failure to bear children, as intended by nature")	3				
	Fertility treatment (e.g., "IVF treatment")	5		Fertility treatment (e.g., "hormones used in IVF treatment")	3				
	Menopausal concerns (e.g., "late onset of menopause")	5		Early menstruation	1				

	Factors which affected women believe may have contributed to the development of their own breast cancer (*n* = 271)[a]			Factors which affected women believe may have contributed to the development of another woman's breast cancer (*n* = 272) [a]			Factors which unaffected women believe may have contributed to the development of another woman's breast cancer (*n* = 114) [a]		
		n	% [b]		*n*	% [b]		*n*	% [b]
	Breastfeeding issues (e.g. "active milk ducts")	3							
	Pregnancy (e.g., "pregnancy 12 months prior diagnosis")	3							
	Use of intrauterine device (e.g., "IUD")	2							
	Termination of pregnancy(e.g. "abortion in my middle 40s")	2							
	Total reproductive history, breastfeeding, and hormones	87	32.10	**Total reproductive history, breastfeeding, and hormones**	72	26.47	**Total reproductive history, breastfeeding, and hormones**	10	8.77
Lifestyle	Drinking alcohol (e.g., "alcohol consumption")	24		Poor dietary habits (e.g., “bad eating habits”)	25		Poor diet	6	
	Being overweight or obese (e.g., "too fat")	16		Drinking alcohol (e.g., “some studies say alcohol may be the cause”)	19		Drinking alcohol	4	
	Poor dietary habits (e.g., "bad eating habits")	12		Being overweight or obese	17		Lifestyle	4	
	Lack of exercise	12		Lack of exercise	12		Lack of exercise	2	
	Lifestyle in general (e.g., "lifestyle")	2		Lifestyle (e.g., “excessive lifestyle; western lifestyle”)	8		Being overweight or obese	1	
	Sun exposure (e.g., "lack of much sunlight")	2							
	Too much exercise (e.g., "over exercise")	1							
	Poor sleep	1							

	Factors which affected women believe may have contributed to the development of their own breast cancer (*n* = 271)[a]			Factors which affected women believe may have contributed to the development of another woman's breast cancer (*n* = 272) [a]			Factors which unaffected women believe may have contributed to the development of another woman's breast cancer (*n* = 114) [a]		
		n	% [b]		*n*	% [b]		*n*	% [b]
	Total lifestyle	70	25.83	**Total lifestyle**	81	29.78	**Total lifestyle**	17	14.91
Causal attributions identified but not validated by expert consensus	Hit to the breast (e.g., "chest injury/trauma")	16	5.90	Injury to the breast (e.g., "injury to breast")	3	1.10	Breast trauma (e.g., "falling on your breast")	2	1.75
Stress	Stress (e.g., "experience of stress in the family/work-stress/stress due to calamities/stress due to trauma")	109	40.22	Stress (e.g., "overwhelming and unrelenting stress over a period of time")	85	31.25	Stress (e.g., "stress not dealt with or not well handled")	17	14.91
Chance or bad luck	Chance or bad luck (e.g., "just plain bad luck")	26	9.59	Chance or bad luck (e.g., just luck of the draw)	17	6.25	Chance or bad luck (e.g., "bad luck")	4	3.51
Smoking	Smoking	6	2.21	Smoking	11	4.04	Smoking	6	2.21
Prior health condition	Vitamin D (e.g., "low vitamin D levels")	19		Immune system (e.g., "poor, weak immune system")	6		Low vitamin D	1	
	Late/incorrect diagnosis (e.g., "lack of correct diagnosis")	3		Vitamin D (e.g., "low vitamin D levels")	4		Injury (unspecified)	1	
	Accidents (e.g., "hit by a car")	1		Prior health (e.g., "major health issues prior to diagnosis")	2		General health	1	

	Factors which affected women believe may have contributed to the development of their own breast cancer (*n* = 271)[a]			Factors which affected women believe may have contributed to the development of another woman's breast cancer (*n* = 272)[a]			Factors which unaffected women believe may have contributed to the development of another woman's breast cancer (*n* = 114)[a]		
		n	%[b]		*n*	%[b]		*n*	%[b]
				Previous fibroids	1				
				Food allergies	1				
				Gum disease	1				
	Total prior health condition	23	8.49	Total prior health condition	15	5.51	Total prior health condition	3	2.63
Other responses	Don't know	4		Multifactorial ("many things can cause cancer; all of the above")	8		Don't know	4	
				Don't know	6				

Note. [a]The sum total of factor percentages is greater than 100 because some respondents mentioned more than one factor

[b]Percentages report for the sample of women who made attributions. Women with unanswered responses are omitted

Discussion

Comparing Personal with General Attributions-the Beliefs of Affected Women

The first aim of this study was to compare attributions within a sample of affected women for their own and other women's breast cancer. Results of a comparison of the attribution checklist showed that affected women reported a similar degree of endorsement for causes of their own and other women's cancer for common lay beliefs for breast cancer, such as stress and chance, despite the lack of scientific evidence. Similar to the findings of the rating scale, findings of the content analysis showed that women frequently identified stress as contributing to the development of their own condition and breast cancer generally. The use of an open-ended question also gave women an opportunity to write about particularly stressful life-events or experiences that they believed contributed to the development of their own or possibly other women's breast cancer.

When inferring what caused their own cancer, affected women may give the greatest weight to their lived experiences, constructing a coherent "story" about what has happened to them. Prior life experiences can help shape attributional responses particularly when individuals attempt to make sense of unexpected and traumatic events (Park, 2010). For example, thinking about the possible causes of one's cancer may be driven by emotional processes as opposed to a logical or rational approach. In his cognitive-experiential self-theory, Epstein (1994, 2000, 2003) posits that people use two information processing systems that operate in parallel; a rational system which is analytical and logical and an experiential system that is intuitive and emotional. The experiential information processing system has been described as a system that is crude and rapid and may be implicated in making sense of stressful situations such as a diagnosis of cancer where rational explanations may not be definitive. This reasoning is consistent with rationalizations whereby women, after diagnosis, link cancer to recent stressful or uncontrollable life events or circumstances.

Interestingly, it appears that there was little consistency between the number of women who endorsed stress as a cause of breast cancer and items pertaining to lifestyle choices, suggesting that women do not perceive a link between the two. This is in contrast to findings that individuals experiencing stress are more likely to engage in poor health-related lifestyle behaviors, which increase their risk of developing cancer. These include increased alcohol consumption, overeating and lack of physical activity (Wang et al., 2010; Willcox et al., 2011). It is possible that for these women, ignoring any potential contribution from lifestyle choices in the development of their breast cancer and attributing their own cancer to factors outside their volition may assist adjustment to their diagnosis. This interpretation is consistent with the self-serving bias that pervades attributions (Krebs & Denton, 2013; Miller & Ross, 1975), and potentially assists with coping.

When traumatic events, such as a diagnosis of cancer, are perceived as controllable by an individual, the individual is held responsible, and consequently evaluated more negatively than when events are seen as less controllable (Weiner, 1993). For example, a review by Lebel and Devins (2008) documented results from 38 studies and concluded that there was "…evidence of increased negative attitudes and more severe consequences of stigma among people that have engaged in a behavior that is perceived as having contributed to their cancer, compared with those who are not perceived to have contributed to their disease" (p. 717). It is possible that feelings of guilt may magnify the trauma for affected women (Bennett et al., 2005; Friedman et al., 2007).

Future studies could look into a more comprehensive assessment of affected women's health behaviors to explore if the extent to which they implicate lifestyle-related risk factors for their own condition depend on whether they engaged in risky behaviors before their diagnosis. It is unclear if women who engage in health behaviors linked to cancer risk, experience a sense of self-blame about making lifestyle choices that could have possibly contributed to their own breast cancer. It is of interest to investigate if a person's health behavior is an important antecedent to affected women's cancer attributions. Moreover, socio-demographic factors may also shape causal attributions and health behaviors. For example, illness perceptions and health behaviors of people who come from more disadvantaged communities and who are repeatedly exposed to stressful and uncontrollable circumstances may differ from those who belong to individuals with better social standing (Rodríguez et al., 2015). Examining the relationships between an individual's socio-demographic background, in addition to prior health-linked behaviors and life circumstances may provide greater insights on how these factors modify the attributional process. It is worth noting that, in the current study, the findings of the categorical analysis showed that there were no associations between affected women's socio-demographic background and those who agree that stress was causal to their own breast cancer suggesting that attribution to stress may be universally endorsed. On the other hand, this result may be due to the relatively homogenous sample of participants. Data on individual's income was also not measured. A relatively large and heterogeneous sample may be needed to further assess the extent to which attributions and health behaviors are modified by personal background and circumstances, as well as past events.

On the other hand, for women who do not have a family history of cancer and are unable to find a specific explanation for their own condition, chance or bad luck may be the only way in which they can justify a poor health outcome (Ashing-Giwa et al., 2004). This is supported by the findings of the categorical analysis, which showed that women without a personal family history of cancer were more likely to agree that chance or bad luck contributed to the development of their own breast cancer than those with an affected first degree relative. A belief that their diagnosis could be depicted as a random, external, and uncontrollable event might have also assisted the management of their own recovery, improving their ease of coping and making sense of what happened, without feeling the potential distress associated with the perception that their actions could have contributed to their illness. The belief that cancer causation might be a random act of bad luck is not restricted to the lay population. A recent study suggests that even those in the medical community interpret some cancers as a result of biological “bad luck”, which may take the form of unexplainable or random mutations (Tomasetti & Vogelstein, 2015).

Notwithstanding their strong endorsement and similar degree of agreement for chance and stress as causes of their own and other women’s cancer, affected women reported significantly higher endorsement for all the other risk factors when focusing on breast cancer in general by comparison to personal attributions. This indicates that affected women make a distinction between personal and population cancer attributions, at least in the context of a rating scale measurement system, which is likely to encourage a comparison strategy for completion. Affected women are more likely to have access to evidence, via their medical team, than the general population, and may seek their own information independently through expert web-sites. When asked about the cause of another woman’s breast cancer, they may be more likely to recognize the influence of evidence-based risk factors, when the focus is on the causes of breast cancer in other women, but make an exception for their own condition. Their educational background may have also influenced what affected women would endorse as causal to another women’s breast cancer. Results of categorical analysis showed that women who obtained a university qualification were more likely to attribute the cause of other women’s cancer to empirically validated risk factors such as aging, use of hormone replacement therapy, and being overweight or obese, than women without a university degree.

It is interesting that chance or bad luck were not as frequently endorsed when women were asked to identify causes in an open-ended manner. This may mean that women have specific ideas about causes of breast cancer. On the other hand, there were also affected and unaffected women who opted not to answer the open-ended question, and it was not possible to confirm if non-respondents were more likely to believe that breast cancer is caused by chance or bad luck compared to those who specified a particular attribution. It is also interesting that around a third of affected women identified lifestyle and reproductive risk factors as causal to their own and other woman's breast cancer. It is important to note that the open-ended question was preceded by the rating scale, and this may have prompted women to reflect on past lifestyle behaviors or reproductive causes that are applicable to them and/or other women. Some women also cited a variety of environmental factors and other prior health conditions such as lack of vitamin D. As the exact cause of an individual’s breast cancer cannot be determined, it is possible that for some affected women, their understanding of factors that cause breast cancer may be a mix of past experience, knowledge gained from health professionals and popular media. It is also important to note that women with less education may also need greater support in obtaining accurate information about breast cancer risk.

Overall, findings of the present study support the three basic assumptions of attribution theory: first, that people attempt to determine the causes of events, they do so in a systematic manner as a way of attempting to make sense of the world, and that attributions have consequences for feelings and behavior (Jones et al., 1971). For affected women, it appears that their breast cancer attributions are influenced by the referent under consideration. Their bias for external and non-modifiable causes such as stress and chance or bad luck may satisfy their personal need to accept and understand their condition. This may explain why there continues to be a disparity between affected women’s causal beliefs for their own breast cancer and expert opinion about risk factors for breast cancer. This also implies that affected women’s personal attributions do not necessarily have to reflect actual risk factors for breast cancer; instead, their attributions may represent a basis for their affective and adaptive response to their cancer.

The second assumption of attribution theory, that the assignment of causes for events is systematic, was also supported. This may mean that there are definite patterns in the explanations made by women. Findings of the study validate the contention that affected women’s cancer attributions are influenced by the referent under consideration (i.e., self or other). Their significantly higher endorsement of biological, lifestyle and reproductive risk factors for breast cancer, when asked about another women’s breast cancer than their own, may mean that they are cognizant of epidemiological evidence but make an exception for their own condition. Affected women’s educational background may also be associated with the type of attribution made, particularly with regards to their beliefs about causes of breast cancer in other women. The type of attributions made, particularly for one’s own breast cancer, is also influenced by context. For example, affected women without a family history of an inherited genetic mutation or lived a healthy lifestyle prior diagnosis may be likely to identify chance or bad luck as a cause of their own diagnosis.

The third assumption of attribution theory is that casual ascriptions have consequences for both feelings and behavior. Affected women’s attributions of causality may be an indication of behavioral intentions as well as motivation to make recommended health-related decisions post-diagnosis. In other words, personal attributions of women impact preventive health behaviors which evidence suggests can help reduce the risk of secondary malignancies (Costanzo et al., 2011). Thus, when women acknowledge that lifestyle choices may have contributed to their breast cancer they may be more likely to engage in healthy lifestyle choices in the future, thereby reducing their cancer risk. This motive for behavior change requires accurate attributions about lifestyle factors suggesting that tertiary prevention programs need to work with affected women to highlight this link, while at the same time avoiding potential stigmatization and guilt. This may also imply that women who attributed their cancer to external and non-modifiable causes may need greater support in finding ways in which they can gain control in the management of their own recovery and survivorship.

Comparing Population Causal Attributions: The Beliefs of Affected and Unaffected Women

The second focus of the present study was to compare attributions between affected and unaffected women. Results of the attribution checklist suggest that women's degree of endorsement of population risk factors for breast cancer is similar, regardless of prior experience. This differs from the hypothesis that breast cancer survivors would agree more with evidenced-based risk factors for breast cancer, than would a population sample. It may be that breast cancer is characterized in the broader population as an uncontrollable and unpreventable disease, regardless of the socio-demographic characteristics tested in the current study. Furthermore, out of all lifestyle-related causes, smoking was the most frequently identified attribution for breast cancer by both groups of women. More non-smoking affected women compared to current smokers or those with a past history of smoking agreed more that smoking is a cause of breast cancer in others, despite there being limited and less consistent evidence that smoking is linked to breast cancer in comparison to other tobacco-related cancers (IARC, 2012). All of these misconceptions highlight the need for improved public health education campaigns communicating accurate and evidence-based messages about the causes and prevention of breast cancer.

Similar to women's responses on the attribution checklist, the results of the content analysis of participants' open-ended responses showed that a belief in biological risk factors, particularly family history of cancer as causal to breast cancer was predominant among affected and unaffected women. Consistent with prior studies (Jones et al., 2011; Wang et al., 2010), almost all unaffected women identified family history as a leading cause of breast cancer in both the rating scale and open-ended question. This suggests that the absence or presence of familial risk is what determines perceived level of risk for breast cancer. Women without an affected relative with breast cancer, may believe that they are at lower than average risk and may be less likely to engage in appropriate screening and preventive behaviors than those with a family history of breast cancer (Jones et al., 2011). In the current study, only 15% (n = 17) of unaffected women endorsed lifestyle causes in the open-ended question format.

An implication of these findings is the need for more comprehensive educational interventions that could guide women in the broader population to develop accurate risk perceptions about breast cancer. There needs to be greater awareness about the link between breast cancer and somatic (or acquired) cellular mutations in affected cells, which can occur from the lifelong interaction between circulating hormones, environmental and lifestyle factors (Hankinson et al., 2004) and how this differs from inherited germline mutations. In addition, an understanding that a family history of cancer may also reflect lifestyle behaviors shared among family members (e.g., high alcohol consumption and low exercise), may also improve reduction of risky health behaviors within families and engagement in appropriate preventive behaviors (Wilson et al., 2002).

Affected women may also play an important role in motivating the general population to be more active with regards to important lifestyle choices that are promulgated in primary cancer prevention messages. Research suggests that cancer survivors have an important educative influence on the general population. For example, Kreuter et al. (2007) reported that personal or firsthand narratives of cancer patients can help overcome resistance to cancer preventive behaviors and associated health messages. If survivors are treated as "trusted experts", it is important that they convey accurate information about breast cancer risk factors, particularly those preventive, lifestyle choices that impact risk, because survivors are uniquely placed to influence population behaviors and, thereby, cancer incidence.

In contrast to findings of the rating scale, smoking was not frequently identified when an open-ended question format was used. Moreover, the idea that stress is a cause of breast cancer was also not as predominant among unaffected women compared to affected women. The rating scale may have prompted women to identify specific risk factors when presented in a structured format. These findings suggest that endorsement of attributions may also depend on how the data were collected (i.e., checklist or open-ended question), and that depending on the method used, there may be differences in the way that breast cancer causation is perceived by affected and unaffected women.

Limitations

This investigation is limited in a number of ways. It is acknowledged that the homogenous nature of the sample limits the generalizability of results and is a weakness of the present study. Affected women who were recruited were diagnosed with breast cancer within the last 5 years and the average age of participants was 50 years old. Most of these women were also Caucasian, well-educated, and a member of a breast cancer community organization such as Breast Cancer Network Australia. The majority of women were also non-smokers and had no first degree relative with breast cancer

There are also a number of limitations with regards to the measure used. A major concern is the failure to gather data on actual behavioral or lifestyle factors which may have influenced women's causal attributions for her own and/or other's breast cancer. Collecting demographic information such as weight (i.e., BMI), alcohol consumption, or minutes of physical activity engaged in per week may be relevant to type of attribution identified. This data could also clarify if the observed endorsement of smoking by women was due to the fact that smoking is a well-known cause of cancer or if endorsement of smoking results in discounting of personal risk from other lifestyle related risk factors that are linked to breast cancer.

This study was also unable to utilize measures that could examine situational determinants and personality variables that might influence attributional patterns. For example, it was not possible to evaluate the difference between self-blame and a realistic assessment of one's own risk factors and degree of endorsement for lifestyle factors, as there was also no measure of self-blame or stigma used in the present study. It may also be possible that participant's ascriptions of causality are influenced by their locus of control.

A further limitation might be the condensed categories that were used in the study to aggregate causal attribution items. A possible weakness of this approach is that all items are given equal weight and that different amounts of variability in the observed variables are ignored (DiStefano et al., 2009). Items with low mean scores are given the same weight as items with a higher mean score. For example, in the biological category, higher mean scores can be observed for the item family history of breast cancer, than the item greater breast density. It is also acknowledged that low alpha values were observed for the biological category. Other alternative ways of grouping survey items are possible. For example, environmental causes of cancer may be composed of all non-genetic risk factors that encompass both environment and lifestyle items, instead of treating them as separate categories (Johnson-Thompson & Guthrie, 2000).

In addition, stress and chance or bad luck were treated as a single-item category in keeping with previous studies on causal attributions (Ferrucci et al., 2011; Willcox et al., 2011). As test construction scholars contend that multiple items are better than a single item in measuring a construct (Iacobucci, Saldanha, & Deng, 2007), it would have been better if additional items were added in the BBCRF that would measure the construct of stress and chance or bad luck.

Summary and Recommendations for Future Research

Overall, this study contributes to a deeper understanding of causal attributions women hold through a comparison of causal attributions between affected and unaffected women. It is evident that personal and general causal attributions for breast cancer among affected and unaffected women are not uniformly consistent with scientific opinion. The relative contribution of modifiable lifestyle risk factors continue also to be understated among women in both groups despite epidemiological evidence. Assessment of the importance of various types of risk factors is also dependent upon the referent against whom risk is being judged; self or other. Affected women agree more with evidence-based risk factors when the focus is on other women's breast cancer, with the exception of stress and chance, which were equally endorsed as risk factors for their own and other's breast cancer. In addition, beliefs about the causes of breast cancer in general are comparable between affected and unaffected women. Beliefs about the causes of breast cancer may also vary depending on the method used such as a rating scale or open-ended question. However, it is important to note that both affected and unaffected women consistently identified biological risk factors, particularly family history of cancer, which may mean that breast cancer continues to be predominantly perceived as a familial disease.

On the whole, there is a need for health professionals to promote further the importance of evidence-based risk factors for breast cancer in general, particularly modifiable lifestyle behaviors. Consequently, future work is necessary to better understand health-related and psychological outcomes of cancer prevention messages currently promulgated and the type of attributions identified.

Chapter 5

Fear of Cancer Recurrence and Psychological Well-being in Women with Breast Cancer: The Role of Cancer Causal Attributions and Optimism

Preface:

The preceding chapter examined the degree of endorsement that women have for specific risk factors that they believe are causal to their own and other women's breast cancer. Among affected women (i.e., women with a previous diagnosis of breast cancer), findings indicated that a majority agreed that stress and chance or bad luck were causal to their own cancer. Stress was also endorsed by affected women as a risk factor for their own and other women's breast cancer.

The main aim of this chapter is to analyze if causal attributions contribute to any variation in FCR and psychological well-being observed among affected women, as well as to investigate if dispositional optimism moderates the relationship between self-referent causal attributions and psychological outcomes. The results of the study could potentially provide health professionals with a greater understanding on how to further support the survivorship needs of affected women, in terms of health promotion and psychosocial support. This chapter utilizes the same dataset reported in Chapter 4 in which women assessed their level of endorsement for each of the 28 items in the Beliefs about Breast Cancer Risk Factors (BBCRF) survey as causal to their own breast cancer. In this chapter, the 28 items are also condensed according to the same broad attribution categories reported in the systematic review (Chapter 2) as well as the previous chapter on the comparison of the attributions among affected and unaffected women (Chapter 4). These categories are biological attributions, environmental attributions, reproductive history, breast-feeding and hormones, lifestyle, other casual attributions identified but not validated by expert consensus. Stress, chance or bad luck and smoking are treated as independent categories as explained in the previous chapter.

Abstract

This study aims to examine the association between cancer causal attributions, fear of cancer recurrence (FCR) and psychological well-being and the possible moderating effect of optimism among affected women. Participants (*N* = 314) completed an online self-report assessment of causal attributions for their own breast cancer, FCR, psychological well-being, and optimism. Simultaneous multiple regression analyses were conducted to explore the overall contribution of causal attributions to FCR and psychological well-being separately. Hierarchical multiple regression analyses were also conducted to examine the potential moderating influence of dispositional optimism on the relationship between causal attributions and FCR and psychological well-being. Biological and stress causal attributions were significantly associated with higher FCR. The attribution of stress was also significantly associated with lower psychological well-being. Optimism did not moderate the relationship between causal attributions and FCR or well-being. The observed relationships between causal attributions for breast cancer and FCR and psychological well-being suggest that the inclusion of causal attributions in screening for FCR is potentially important. Health professionals may need to provide greater psychological support to women who attribute their cancer to non-modifiable causes and consequently continue to experience distress.

Keywords: breast cancer; causal attributions; fear of cancer recurrence; well-being; optimism; survivorship

Introduction

In 2012, 1.7 million women were diagnosed with breast cancer making it the most frequently diagnosed cancer among women worldwide (Ferlay et al., 2013). In Australia, it is estimated that 15,934 new cases of breast cancer among females were diagnosed in 2016 (AIHW, 2016). Although many women are able to cope with a breast cancer diagnosis, some women experience declines in mental health following diagnosis and report a high level of psychological distress that may have additional implications for functioning and well-being (Helgeson, Snyder, & Seltman, 2004; McDonough et al., 2014; Oxlad et al., 2008). Fear of cancer recurrence (FCR) or concerns about possible disease progression are also widespread concerns among affected women (Costanzo et al., 2007), with estimates of the prevalence of moderate to high levels of FCR ranging from 24% to 56% (Mehnert, Berg, Henrich, & Herschbach, 2009; Simard et al., 2013; van den Beuken-van Everdingen et al., 2008).

Causal attributions also have consequences for feelings and behavior. Identifying factors which patients believe may have contributed to the development of their own illness or making causal attributions is one of the ways a patient is able to "make sense and find meaning" in their illness experience (Park et al., 2008). Following the cognitive adaption theory, of Taylor, Litchman, & Wood (1984), affected women who are able to find meaning in their breast cancer experience, felt a sense of control and able to restore self-esteem were emotionally better adjusted than those who lacked these perceptions.

Weiner's (1985, 1986) attribution theory states that there are three major dimensions of attributions: locus of causality, stability and controllability. He referred to the locus of causality as the internal-external dimension, which is a comparison between dispositional and situational causes. In the dimension of stability, causes are characterized as stable or temporary in character. The final controllability dimension is the degree of volitional influence that one has over a cause, which is likely to vary between attributions. Weiner (1985, 1986) proposed that affective responses and tendencies to action are mediated, in part, by individual scores on the combination of attribution dimensions.

A number of studies have explored affected women's beliefs about the causes of their breast cancer. Results from a systematic review of these studies (Dumalaon-Canaria et al. 2014) indicated that, over the last 30 years, women with a history of breast cancer identified family history of cancer, stress, environmental exposures, and chance or bad luck as causal to their own cancer. In a National Institute of Health study of causal attributions among cancer survivors, thematic categories of attributions were classified according to two dimensions, locus and controllability (Ferrucci et al., 2011). Excluding family history of cancer, it is unclear if causes such as stress, environmental exposures, and chance or bad luck are perceived as stable or temporary in character. Furthermore, although stress may be considered a controllable attribution (e.g. controlled via relaxation or other stress management techniques), past research suggests that women tend to associate stress with difficult life-events or situations that are outside of their volitional control (Costanzo et al., 2011; Kwok & White, 2011; Lavery & Clarke, 1996; Panjari et al., 2012). The systematic review (see Chapter 2) also established that affected women did not regularly view past behaviors as relevant to their own illness, despite the widespread promulgation of lifestyle risks in cancer prevention messages. These results have been at least partially confirmed with a strong tendency for survivors to attribute cancer to chance or bad luck, not only as causal for their own breast cancer but other women's breast cancer as well

Previous research has also found evidence of a negative association between attributing cancer to past lifestyle choices, stress and overall well-being. Women who attributed their breast cancer to lifestyle-related causes were found to experience distress at the thought that their actions could have contributed to the development of their illness (Bennett et al., 2005; Friedman et al., 2007; Glinder & Compas, 1999). Janoff-Bulman (1992) described this as a type of behavioral “self-blame”, in which individuals feel responsible for negative outcomes. Panjari et al. (2012) reported that women who specifically endorsed stress as a contributing factor to their breast cancer reported lower psychological well-being. Similarly, in a study of affected women taking adjuvant endocrine therapy following breast cancer, those who believed that stress was responsible for their own breast cancer reported greater FCR than those who did not attribute their cancer to stress (Corter, Findlay, Broom, Porter, & Petrie, 2013).

Attributions have also been associated with positive outcomes. For example, Leventhal et al. (1997) reported that beliefs about illness causation can be a motivating factor that can drive patients to make necessary changes in health behaviors. Consistent with this, Costanzo et al. (2011) demonstrated that changes in health practices were related to personal beliefs about illness causation. For example, affected women who attributed the cause of their own breast cancer to lifestyle behaviors reported improvements in diet or physical activity, and a reduction in alcohol use following diagnosis and treatment.

Roesch and Weiner (2001) presented a meta-analytic review of causal attributions (using Weiner's theory of attribution dimensions, Weiner 1985, 1986), coping, and psychological adjustment in individuals with physical illnesses. They argued that patients who believed that their lifestyle caused the onset of their illness may initially experience decrements in self-esteem. However, this belief does not prevent an improvement in expectancy for success in coping and future recovery. As lifestyle attributions can be characterized as internal, controllable and unstable, this belief can motivate individuals to actively address or minimize the impact of their illness, which consequently leads to more positive psychological adjustment. By contrast, individuals who ascribed to external, and uncontrollable causes (but not uniformly stable or unstable) such as a belief in environmental causes, were able to avoid feelings of guilt that they contributed to the development of their illness, but were less well-adjusted than individuals who explained the cause of their illness as controllable. It is important to note that Roesch and Weiner's (2001) study had a sample of patients with different conditions, and further research is required to test whether their findings can be generalized to a cohort of affected women. Lifestyle attributions may be considered internal, unstable and controllable and therefore, may motivate changes that impact future risk. It is possible that biological risks are stable and uncontrollable and therefore may be associated with poorer psychological well-being. Finally, stress may be conceptualized as external and uncontrollable and associated with difficulties adjusting to their cancer. Further research is needed to explore these relationships in a sample of women affected by breast cancer.

Moreover, cohort characteristics and individual differences might moderate the impact of attributions on FCR and well-being. For example, a personality variable such as dispositional optimism, may also influence how individuals approach and react to critical life situations (Scheier, Carver, & Bridges, 2001; Carver & Scheier, 2014). This may also help to explain the wide variation in attributions and associated psychological outcomes (Helgeson et al. 2004; McDonough, Sabiston, & Wrosch, 2014). Carver and Scheier (2014) defined dispositional optimism as a facet of personality that is inherently cognitive in nature and encompasses expectancies regarding future outcomes. Individuals who are optimistic have a greater tendency to believe that they will generally experience good outcomes in life, and are motivated to take a proactive approach in improving their health. An individual's level of optimism might be a protective internal resource. For example, individuals with high optimism may strive to cope actively with their condition despite having attributed their illness to uncontrollable causes, thereby contributing to greater well-being and lower fear of cancer of cancer recurrence.

Furthermore, the lack of a standardized way of measuring causal attributions for breast cancer may have also contributed to inconsistencies found in the literature with regards to the factors which women believe contributed to the development of their breast cancer. Across quantitative studies, there is heterogeneity with regards to the number of items, question wording, and the type of scale used in questionnaires that aimed to capture beliefs about breast cancer risk factors (Kulik & Kronfeld, 2005; Lizama et al., 2016; Oba et al., 2009; Rabin & Pinto, 2006; Thomson et al., 2014; Timko et al., 1985). In case-control studies that aimed to determine women’s beliefs about breast cancer risk factors (Lizama et al., 2016; Thomson et al., 2014), women with and without breast cancer were given the same questionnaire and asked to rate each item for their effect “on the chance of getting breast cancer”. It remains unclear if the cohort of affected women were referring to their own or other women’s breast cancer. Moreover, the way that women were asked about factors which they believed caused their breast cancer may have also prompted particular responses. For example, when Panjari et al. (2012) asked their participants to, “Please tell us which event(s) or underlying circumstance(s) you believe may have contributed to the development of your BC (breast cancer).” This may have triggered women to think of stressful events or circumstances which they feel contributed to the development of their illness.

The main aim of this study is to investigate the relationship between women’s self-referent causal attributions and psychological outcomes. The research questions are as follows: Do affected women’s causal attributions for their own breast cancer predict their FCR and psychological well-being and does optimism moderate the relationship between causal attributions and FCR and psychological well-being?

It is hypothesized that causal attributions will predict FCR or psychological well-being; specifically, affected women's endorsement of non-modifiable risk factors as a cause of their own breast cancer will be associated with greater FCR and poorer psychological well-being. A moderating effect is also hypothesized: higher levels of optimism are expected to reduce distress in the case of affected women who endorse uncontrollable risk factors as causal to their own condition. In contrast, lower levels of optimism, are expected to result in greater FCR and lower psychological well-being for women who endorsed uncontrollable risk factors as causal to their own condition.

Methods

Participants

Eligible participants were females who have been previously diagnosed with breast cancer within the last five years; were 18 years old and above; and were able to read and write in English. As the researchers obtained approval from Breast Cancer Network Australia (BCNA) to recruit through their Review and Survey Group, participants were recruited from across Australia. The study was also advertised in various cancer-related organizations such as Australian breast cancer support groups and a university located in South Australia. Women who agreed to be contacted for the study were provided with a secure link to access an information sheet and an online survey. Researchers obtained ethics approval for this project from the Flinders University Human Research Ethics Committee and informed consent was obtained from all participants.

Measures

Beliefs about breast cancer risk factors (BBCRF). There is no standardized way to measure causal attributions for breast cancer and, consequently, the findings of a systematic review (see Chapter 2) were used to develop a measure, "Beliefs about Breast Cancer Risk Factors." The systematic review summarized documented causal attributions for breast cancer among affected women and published scientific evidence on risk factors for breast cancer.

The list of empirically supported risk factors for breast cancer were based on reports from the World Cancer Research Fund (World Cancer Research Fund & American Institute for Cancer Research, 2007), International Agency for Research on Cancer's review of human carcinogens and lifestyle factors (The International Agency for Research on Cancer, 2010), and a chapter on breast cancer risk factors from the Breast Cancer: Risk Reduction and Early Detection Strategies textbook (Newcomb & Wernli, 2010), and the Australian Institute of Health and Welfare (AIHW, 2012). The systematic review found that affected women frequently and strongly endorsed factors with no or limited scientific support such as chance or bad luck and stress as causal to their own breast cancer. Therefore, it was important to include both lay and evidence-based attributions in the measure.

The BBCRF survey was designed to capture beliefs about risk factors for breast cancer. The measure assessed the participant's level of endorsement of risk factors empirically associated with breast cancer (e.g., being overweight or obese), as well as anecdotal or common lay explanations for breast cancer that have limited or no scientific evidence (e.g., chance or bad luck). All participants were asked to respond to each item in terms of their own breast cancer using a five-point scale ranging from 1 (strongly disagree that it caused their own breast cancer) to 5 (strongly agree that it caused their own breast cancer).

As in Chapter 4, to allow grouping of multiple related factors, risk factors were condensed into 8 categories (five rational groupings and three individual or single-item attribution categories). The five rational groupings were : "Biological attributions" (family history of breast cancer, aging, greater breast density, history of benign breast conditions, height, race; “Environmental attributions” (air pollution, type of occupation, exposure to pesticides/chemicals, exposures to radiation; exposure to second hand smoke); “Reproductive history, breastfeeding, and hormones” (age at first menstruation; later age at first pregnancy, never having children, not breastfeeding, use of hormone replacement therapy; use of oral contraceptives); “Lifestyle ” (being overweight or obese, drinking alcohol, lack of exercise; poor dietary habits); “Causal attributions identified but not validated by expert consensus" (personality type, fate/destiny, God's plan, previous injury or trauma to the breast). The three individual attributions were "Stress”, “Chance or bad luck”, and "Smoking". The rationale for treating these items as individual attributions is to be consistent with and allow for comparisons with previous research (Ferrucci et al., 2011; Wilcox et al., 2011).

The psychological general well-being index (PGWB) (Dupuy, 1984). The psychological well-being of participants was measured by the Psychological General Well-being Index (PGWB). This scale is composed of 22 items that measure six domains: anxiety, depressed mood, positive well-being, self-control, general health and vitality. For each question, there are six response options ranging from 0 to 5 where 0 is the most negative response for general well-being and the most positive option is 5. The sum of scores on the 22 items provides an overall total score, with scores ranging from 0 to 110. Higher scores are associated with a higher level of subjective well-being. For this study, the PGWB demonstrated high internal consistency with Cronbach’s α coefficient of .95. Internal consistency for each of the 6 domains of the PGWB for this study are anxiety (α =.88), depressed mood (α =.87), positive well-being (α =.87), self-control (α =.78), general health (α =.73) and vitality (α =.87)

The concerns about recurrence scale (CARS) (Vickberg, 2003). The first part of the CARS assessed overall FCR with four questions that measured the perceived likelihood of experiencing cancer recurrence, the frequency with which participants thought about recurrence, time spent thinking about possible recurrence, and the extent to which thoughts about recurrence were emotionally distressing. Participants responded to each question on a 6-point Likert scale ranging from 1 (not at all) to 6 (all the time). An overall FCR score was calculated by summing the four items (range = 4-24) with higher scores indicating greater FCR. The internal consistency of the CARS for this study was high with Cronbach's α coefficient of .91. The second part of the CARS, which measures the nature of women's concerns about recurrence, was not utilized in the present study, because the study is focused on obtaining an overall measure of extent of fear of cancer recurrence (Vickberg, 2003)

The life orientation test-revised (LOT-R) (Scheier et al., 1994). This is a 10-item (six target items and four fillers) self-report scale assessing an individual's level of dispositional optimism. Respondents indicated the extent to which they agreed with each item using a 5-point Likert type scale ranging from 0 (strongly disagree) to 4 (strongly agree). Excluding the filler items, a total score is calculated by summing the three positively worded and three negatively worded items which are reverse coded. LOT-R total scores range from 0 to 24 with higher scores indicating greater optimism. The internal reliability in the present study for this scale was .80.

Analysis

Zero-order correlation analyses (using Pearson's *r* correlation) were initially undertaken to explore associations between the dependent variables (FCR as measured by the CARS and psychological well-being as measured by the PGWB) and independent predictor causal attribution variables (biological attributions, environmental attributions, reproductive history, breastfeeding and hormones, lifestyle attributions, causal attributions identified but not validated by expert consensus, stress, chance or bad luck, and smoking) and dispositional optimism.

Simultaneous multiple regression analyses were conducted to explore the overall contribution of predictor variables (i.e., demographic variables, dispositional optimism, and causal attributions) to FCR and psychological well-being separately. All independent variables were entered into the equation in one step (i.e., forced entry).

To examine the potential moderating influence of dispositional optimism on the relationship between causal attributions for one's own cancer and FCR and psychological well-being separately, hierarchical multiple regression analyses was also used. Variables included in the hierarchical multiple regression analyses were those that significantly contributed to the variance in FCR and well-being scores in the simultaneous regression analyses. Categorical demographic variables (i.e., education, ethnicity, marital status, first degree relative with breast cancer, smoking status, and breast cancer stage at diagnosis) were dummy coded.

Results

Characteristics of the Sample

A total of 314 breast cancer survivors (mean age = 55.22, *SD* = 9.32), who were diagnosed within the last five years participated in the study (mean time since diagnosis = 2.89 years, *SD* = 1.26). Of the 314 women, majority were Caucasian, married, and obtained a university education. More than half of participants indicated that they have no previous smoking history. Twenty three percent of participants had a first degree relative that was diagnosed with breast cancer (see Table 1).

Table 1

Demographic characteristics of affected women (n = 314)

Characteristic	n, %
Ethnicity	
Caucasian	306 (97.45%)
Asian	3 (0.96%)
Indigenous Australian	5 (1.59%)
Education	
University education	180 (57.32%)
TAFE or technical education	77 (24.52%)
Secondary school	57 (18.15%)
Marital status	
Married	203 (64.65%)
Separated	39 (12.42%)
De-facto relationship	29 (9.24%)
Single/never married	42 (13.38%)
(missing data *n* = 1)	
Smoking status	
Current smoker or previous history of tobacco smoking	99 (31.53%)
No previous history of tobacco smoking	215 (68.47%)
Family history	
First degree relative diagnosed with breast cancer	71 (22.61%)
No first degree relative diagnosed with breast cancer	237 (75.48%)
(missing data *n* = 6)	
Breast cancer stage [a]	
Local	87 (27.71%)
Regional	176 (56.05%)
Distant	39 (12.42%)
(missing data *n* = 12)	

Note. [a] = According to the SEER Summary Stage system (Young et al. 2001), local stage refers to cancers that are confined to the breast (corresponding to stage I and some stage II cancers in the TNM staging system); regional stage refers to tumors that have spread to surrounding tissue or nearby lymph nodes (generally corresponding to stage II or III cancers, depending on size and lymph node involvement). Distant stage refers to cancers that have metastasized (spread) to distant organs or lymph nodes above the collarbone (corresponding to stages IIIc and IV

Correlation Analysis

The relationships between variables were investigated using Pearson product moment correlation coefficient. The results are shown in Table 2. Bivariate relationships showed that FCR was negatively correlated with dispositional optimism. In contrast, psychological well-being was correlated positively with dispositional optimism. With regard to attribution variables, biological, environmental, lifestyle, and stress attributions were positively correlated with FCR, demonstrating that the higher the endorsement of the said attributions variables, the greater the anxiety about possible disease progression.

In contrast, causal attribution to environmental attributions, stress, and other causal attributions identified but not validated by expert consensus were found to be negatively related with psychological well-being. The said attribution variables, likewise, were negatively related to dispositional optimism. These suggests that the higher the endorsement of the said attribution variables, the lower the psychological well-being and dispositional optimism.

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Table 2

Correlations between causal attributions and psychological outcome variables

Variables	1	2	3	4	5	6	7	8	9	10	11
1. Biological attributions		.367***	.456***	.330****	.207****	.056	-.097	.208***	-.048	.152**	-.047
2. Environmental attributions	.367***		.453***	.407***	.344***	.322***	-.068	.342***	-.133*	.209***	-.160**
3. Reproductive history, breastfeeding, and hormones	.456***	.453***		.556***	.276***	.103	-.032	.424***	-.067	.096	-.026
4. Lifestyle attributions	.330***	.407***	.556***		.217***	.192***	-.072	.419***	-.101	.136*	-.088
5. Causal attributions identified but not validated by expert consensus	.207***	.344***	.276***	.217***		.365***	.199***	.136*	-.254***	.079	-.162*
6. Stress	.056	.322***	.103	.192***	.365***		.009	.058	-.215***	.239***	-.236***
7. Chance or bad luck	-.097	-.068	-.032	-.072	.199***	-.009		-.048	-.068	.090	-.009
8. Smoking	.208***	.342***	.424***	.419***	.136*	.058	-.048		-.036	.090	-.050
9. Dispositional optimism	-.048	-.133*	-.067	-.101	-.254***	-.215***	-.068	-.036		-.282***	.505***
10. Fear of cancer recurrence	.152**	.209***	.096	.136*	.079	.239***	.090	.090	-.282***		-.466***
11. Psychological well-being	-.047	-.160**	-.026	-.088	-.162*	-.236***	-.009	-050	.505***	-.466***	

Note. $^{*}p<.05$ $^{**}p<.01$ $^{***}p<.001$

Predictors of FCR and Psychological Well-Being

To examine whether certain predictor variables explain or account for the variance in psychological outcomes, two simultaneous multiple regression analyses were performed to examine the extent to which demographic variables, dispositional optimism and causal attribution categories predicted FCR or psychological well-being respectively. The forced entry method was used to generate the regression models. All independent variables were entered into the equation. All independent (predictor) variables were entered into each of the equations in one step simultaneously in order to determine how much variance in the psychological outcomes measured was explained by our independent variables as a predictor set as well as an indication of the relative contribution of each independent variable individually (Pallant, 2010).

Prior to conducting the simultaneous multiple regression analyses, data were examined to assess compliance with assumptions. A power analysis for a multiple regression with 17 predictors was conducted using an a-priori sample size calculator (danielsoper.com/statcalc/calculator.aspx?id=1) to determine a sufficient sample size using an alpha of 0.05, a power of 0.95, and a medium effect size ($f^2 = 0.15$). Based on the aforementioned assumptions, the desired sample size is 219. The sample size of 314 met the requirements specified by the power analysis.

Bivariate analyses between independent variables were also conducted to ensure that the multicollinearity assumption was not violated. It was observed that there were no correlation coefficients above $r = .7$, the usual threshold for multicollinearity (Dormann et al., 2012). Collinearity diagnostics were also performed separately for each of the simultaneous multiple regression analyses predicting FCR or psychological well-being. A tolerance value of less than .10 and variance inflation factor of above 10 (Pallant, 2010) were used as cut-off points for determining the presence of multicollinearity. All of the tolerance and variance inflation factor values were within the cut-off points which suggest that no multicollinearity was observed among the variables.

An inspection of the histograms for standardized residuals and the normal probability plots of residuals satisfied the assumption of normally distributed errors for both the simultaneous multiple regression analyses conducted. This satisfies the assumption of normality. Standardized residuals (Z-RESID) were plotted against the standardized predicted values of the outcome variable (Z-PRED) to check the assumptions of homoscedasticity and linearity using SPSS as recommended by Pallant (2010). The plots of the two regression procedures did not show violation of these two assumptions.

Mahalanobis distance was calculated to examine residual statistics for outliers. There were seven cases that had a Mahalanobis distance exceeding the critical value of 40.79 (using an alpha level of .001) in both regression models predicting FCR and psychological well-being. To further check if outliers had any undue influence on the two simultaneous multiple regression equations as whole, Cook's distance was also determined. The Cook's distance for the regression model predicting FCR was .04 and for psychological well-being was .08, which are both below the cut-off value of Cook's distance of 1 (Pallant, 2010). Therefore, the outliers found did not have any undue influence upon the regression solutions and all cases were used in the two simultaneous regression equations.

The predictor variables accounted for 27.3% of the variance in FCR, ($R^2 = .273$, F (17, 280) = 6.19, $p < .001$). Age, ethnicity, breast cancer stage at diagnosis, low dispositional optimism, and the extent to which cancer was attributed to biological attributions and stress were all significant predictors of FCR (see Table 3).

This analysis was repeated with psychological well-being as the outcome variable. Here the predictors explained 30.9% of the variance in well-being ($R^2 = .309$, F(17,280) =

7.35, $p < .001$). Breast cancer stage at diagnosis, optimism and attribution to stress emerged as significant predictors, with optimism ($\beta = .48$, $p < .001$) having more impact than the attribution of stress ($\beta = -.11$, $p = .05$) (see Table 3).

Table 3

Simultaneous multiple regression analyses predicting FCR and well-being

Predictor variables	FCR β	Well-being β
Age	-.248***	.047
Time since diagnosis	.047	-.016
Education[a]	-.008	.017
Ethnicity[a, b]	.155**	-.046
Marital status[a]	-.062	-.048
First degree relative with breast cancer[a]	.023	.009
Smoking status[a]	.020	.005
Breast cancer stage at diagnosis[a, c]	.152**	-.138**
Optimism	-.262***	.481***
Biological attributions	.214***	-.030
Environmental attributions	.096	-.071
Reproductive history, breastfeeding, and hormones	-.061	.082
Lifestyle attributions	-.024	.008
Other causal attributions identified but not validated by expert consensus	-.108	.015
Chance or Bad luck	.080	.024
Smoking	.060	-.036
Stress	.185**	-.110*
Total R^2	.273	.309

$^*p<.05$ $^{**}p<.01$ $^{***}p<.001$

Note. [a]Demographic variables were also dummy coded as follows: ethnicity (Caucasian = 1 versus non-Caucasian = 2), education (university = 1 versus non-university graduates = 2), marital status (married = 1 versus not married = 2), smoking history (smoker or has past history of smoking = 1 versus never smoked = 2), family history of breast cancer (has an affected first-degree relative with a previous diagnosis of breast cancer = 1 versus no affected first degree relative = 2), breast cancer stage at diagnosis (local = 1 versus regional and distant = 2)

[b]Independent samples *t*-tests were conducted to explore potential differences by ethnicity (Caucasian or non-Caucasian). Caucasian women had lower FCR scores ($M = 12.30$, $SD = 5.13$) than Non-Caucasian women ($M = 17.00$, $SD = 5.07$; $t(308) = -2.56$, $p = .011$). However, the effect size was small (eta squared = .002) indicating a non-significant difference in FCR scores by ethnicity. As only eight participants (2% of the total sample) were from a Non-Caucasian ethnic group, further exploration of the impact of ethnicity on FCR with a bigger sample of women from diverse backgrounds is suggested.

[c]Affected women who were diagnosed with breast carcinoma in situ or localized breast cancer reported significantly lower FCR scores ($M = 10.80$, $SD = 4.84$) than women who were diagnosed with regional and distant breast cancer ($M = 13.15$, $SD = 5.22$ $t(296) = -3.59$, $p < .001$ (eta squared = .04)

Optimism as a Moderator of the Relationship Between Causal Attribution and FCR and Psychological Well-being

Hierarchical multiple regression analyses were also conducted in order to examine whether dispositional optimism moderated the relationship between causal attributions and FCR or psychological well-being. Biological attributions and stress attributions were identified as significant predictors of FCR and hierarchical multiple regression tested whether higher dispositional optimism ameliorated the impact of making biological and stress attributions on affected women's FCR. Specifically, this analysis determined whether dispositional optimism protected the psychological well-being of women who believed that stress or biological factors contributed to the development of their cancer.

To test for moderation, Aiken and West (1991) propose that an interaction effect between the predictor and the moderating variable signifies that regressing the criterion variable on the predictor variable depends on the value of the moderating variable. That is, a conditional effect is present when the effect of the moderator is conditional on the predictor variable (Aiken & West, 1991). In this regard, the regression of causal attribution on FCR and psychological well-being respectively depends on the values of the specific causal attribution and optimism, which are the moderator variables.

Two hierarchical multiple regressions were conducted with FCR as the outcome variable. Each regression model tested the independent contribution of causal attribution variables that significantly predicted FCR in the simultaneous multiple regression model specifically biological attributions and stress.

Age, ethnicity, and breast cancer stage at diagnosis were entered in Step 1, because these socio-demographic variables were significantly associated with FCR in the simultaneous regression model (see Table 3). The main effects of the respective causal attribution (i.e., biological attributions or stress) and optimism were entered in Step 2 in each regression. Following recommended procedures for testing interactions in multiple regression (Aiken & West, 1991), optimism and causal attribution were centered to reduce issues of multicollinearity. This was created by, first, obtaining mean attribution (i.e., biological attributions or stress) and optimism of the sample. Next, the mean value of each variable was subtracted against the mean score of each participant on that same variable. A product term was then created by multiplying the centered values of the specified causal attribution (predictor) and optimism (moderator) which was entered in Step 3.

Using hierarchical regression to explore the extent to which optimism moderated the relationship between attributing the cause of one's own breast cancer to biological attributions and FCR, Step 1 indicated that age (β = -.25, p < .001), ethnicity (β = .16, p = .002), and breast cancer stage at diagnosis (β = .15, p =.005) were significant predictors of FCR. Step 2 showed the main effects of biological attributions (β = .19, p < .001) and optimism (β = -.28, p < .001) on FCR and Step 3 indicated that the product term of biological attributions and optimism was non-significant (β = .01, p = .875). This model accounted for 22.30 % of the variance in FCR, (R^2 = .223, F(6, 291) = 13.93,p <.001) (See Table 4).

Table 4

Hierarchical Multiple Regression Analyses Predicting Fear of Cancer Recurrence with Biological Attribution as Predictor and Optimism as Moderating Variable

Predictors	ΔR^2	β
Step 1	.11***	
Age		-.25***
Ethnicity		.16**
Breast cancer stage at diagnosis		.15**
Step 2	.12***	
Biological attribution		.19***
Optimism		-.28***
Step 3	.00	
Biological attribution x Optimism		.01
Total R^2	.22***	

**p*<.05, ***p*<.01, ****p*<.001

For the model assessing the extent to which optimism moderated the relationship between attributing the cause of one's own breast cancer to stress and FCR, Step 1 indicated that age (β = -.21, $p < .001$), ethnicity (β = .15, p =.003), and breast cancer stage at diagnosis (β = .16, p =.004) were significant predictors of FCR. In Step 2, causal attribution to stress (β = .16, p = .003) and optimism (β = -.25, $p < .001$) were significant predictors of FCR. However, the product term of optimism and causal attribution to stress was non-significant (β = .02, p = .470). This shows the main effects of causal attribution to stress and optimism on FCR, but no moderator effect was present, indicating that optimism does not moderate the relationship between causal attribution to stress and FCR. This model accounted for 21.5 % of the variance in FCR, (R^2 = .215, F(6, 291) = 13.25, $p < .001$) (see Table 5).

Table 5

Hierarchical Multiple Regression Analyses Predicting Fear of Cancer Recurrence with Causal Attribution to Stress as Predictor and Optimism as Moderating Variable

Predictors	ΔR^2	β
Step 1	.11	
Age		-.21***
Ethnicity		.15**
Breast cancer stage at diagnosis		.16**
Step 2	.11	
Causal attribution to stress		.16**
Optimism		-.25***
Step 3	.00	
Causal attribution to stress x Optimism		.02
Total R^2	.21***	

*p<.05, **p<.01, ***p<.001

Hierarchical multiple regression analyses were also conducted to explore the extent to which optimism moderated the relationship between causal attributions and well-being. Causal attribution to stress was used in this model because it was the only type of attribution that significantly predicted psychological well-being in the simultaneous multiple regression model. Breast cancer stage at diagnosis was entered in Step 1, as results of the simultaneous multiple regression showed that it was a significant demographic predictor of well-being. At Step 2, breast cancer stage at diagnosis (β = -.15, p = .003), optimism (β = .48, p < .001) and attributing one's own cancer to stress (β = -.13, p = .014) were significantly associated with well-being. In Step 3, the interaction of causal attribution to stress and optimism was non-significant (β = .01, p = .809) indicating the lack of moderation effect. This model accounted for 29.4 % of the variance in well-being (R^2 = .294, F(4,293) = 30.56, p< .001) (see Table 6).

Table 6

Hierarchical Multiple Regression Analyses Predicting Psychological Well-Being with Causal Attribution to Stress as Predictor and Optimism as Moderating Variable

Predictors	ΔR^2	β
Step 1	.02**	
Breast cancer stage at diagnosis		-.15**
Step 2	.27***	
Optimism		.48***
Causal attribution to stress		-.13*
Step 3	.00	
Optimism x Causal attribution		.01
Total R^2	.29***	

**p*<.05, ***p*<.01, ****p*<.001

Discussion

The present study examined the relationship between self-referent causal attributions and FCR and psychological well-being among affected women, and the potential moderating role of optimism. Results indicated that affected women's attribution of causation to biological and stress attributions was associated with greater FCR. Affected women who had lower optimism also reported greater FCR. The findings of this study also suggested that among the demographic factors investigated, younger women from a non-Caucasian background, and those with a more advanced diagnosis of cancer experienced higher FCR. Causal attribution to stress was associated with poorer psychological well-being. Results also indicated that optimism contributed most to variance in well-being scores and was a stronger correlate of well-being than stress attributions. Optimism did not moderate the effect of biological or stress attributions on FCR. Similarly, optimism also did not moderate the relationship between stress attributions and psychological well-being.

Applying the attributional dimensions from Weiner's theory (1985, 1986), biological attributions can be characterized as a cause that is perceived as internal, stable, and uncontrollable. In Roesch and Weiner' (2001) meta-analysis, this pattern was also found to be indirectly associated with negative psychological adjustment through the use of avoidance coping. The association between biological attributions and FCR, extend findings of previous studies by suggesting that affected women who presumably believe that they lack the ability to overturn or minimize the impact of the illness, as a consequence of a biological cause that cannot be changed or is not within their volition, are those who have greater anxiety about possible disease progression.

Unlike biological attributions, it is difficult to identify an exact dimensional pattern for stress. In some studies, stress has been classified as internal and controllable (Ferrucci et al., 2011) whereas other studies describe stress as an external life-event or circumstance that, to some extent, may be perceived as not within one's control (Costanzo et al., 2011; Kwok & White, 2011; Lam & Fielding, 2003; Lavery & Clarke, 1996; Panjari et al., 2012). As individuals who made more controllable attributions reported being more well-adjusted than individuals who made more uncontrollable attributions (Roesch & Weiner, 2001), it could be speculated that there are women in the present study who perceive that the stress they attribute their illness to is uncontrollable. Likewise, there may also be women in the present study who characterize their attribution to stress as stable in nature, particularly if they continue to feel upset by life-events or circumstances which they feel contributed to the development of their own breast cancer.

Browall et al. (2015) reported that, post-diagnosis, affected women continued to experience stressful events. They found that women with primary breast cancer continued to be bothered by external stressors that are related to family problems and environmental concerns, which are factors that some women viewed as causal to their own breast cancer (Costanzo et al., 2011; Kwok & White, 2011; Lavery & Clarke, 1996; Panjari et al,. 2012). Furthermore, in their systematic review, Antonova, Aronson, and Mueller (2011) discussed the uncertain nature of the relationship between stress and cancer, highlighting the positive link between exposure to stressful life-events combined with prolonged or elevated presence of cortisol and risk of breast cancer. This correlation parallels women's anecdotal explanations for cancer induced by stress. In this regard, the experience of acute stressors that occur within a relatively brief period of time may mean that stress is an external, uncontrollable and stable attribution for these women. Moreover, findings of the study which showed that causal attribution to stress was positively associated with FCR and negatively related to psychological well-being may be consistent with Weiner's theory (1984, 1985) on the relationship between stable and uncontrollable attributions with negative psychological adjustment and avoidance forms of coping to illness.

The significant associations found between women's attributions of causality to stress and the psychological outcomes measured (i.e., FCR and well-being) may also highlight women's affective responses to personally held attributions of cancer causation. On the basis of Epstein's (1994, 2000, 2003) cognitive-experiential self-theory, it is possible to contend that thinking about the possible causes of one's cancer may be driven by emotional as opposed to logical or rational mechanisms, particularly during the period of diagnosis, when women are trying to make sense of their situation and consequently experience a myriad of emotions.

Applying the literature on meaning making and psychological adjustment to cancer, future research may also want to investigate if women who attribute their cancer to uncontrollable and stable causes, are able to reap the positive benefits of searching or appraising (which includes making causal attributions) the meaning of their cancer, such as posttraumatic growth and life meaningfulness (Park et al., 2008). Attributions may be used as a tool to identify affected women who have difficulty in cognitively adapting to their cancer, or succeeding in cognitive and affective tasks; such as finding meaning in their experience, knowing that they are in control and have the ability to master themselves and their surroundings, and restoring their feelings of self-worth and self-esteem (Taylor, 1983). Attributions may also help identify women who have difficulty in independently resolving cancer-induced existential concerns. For example, Lepore and Kernan (2009) reported that searching for meaning after breast cancer diagnosis and treatment was not only futile but also distressing for some women. It would be interesting to know the cancer causal attributions made by these women to determine if attributions have a mediating role between meaning making and psychological adjustment following cancer.

Nonetheless, it is important to note that optimism contributed most to the variance in well-being scores and was a stronger correlate of variance in well-being than endorsement of stress as a causal attribution, suggesting that the extent to which affected women are generally positive may be predictive of psychological well-being than their causal attributions. Furthermore, our finding of a limited association between causal attributions and psychological well-being, with the exception of stress attributions, suggests that post-diagnosis and treatment, women's well-being relates to factors other than seeking a reason for their cancer.

Together, these findings suggest that there is a need to sensitize health care providers to the linkage between causal attributions and affective responses and how this association might impact women's adaptation to breast cancer. Moreover, these findings also suggest the potential use of the measurement of personal attributions in screening for FCR and cancer-related distress. Screening attributions could help health professionals identify and provide additional psychosocial support for affected women who continue to feel emotionally distressed about uncontrollable life-events or circumstances that might be linked to their attributions of causality. This may be an important health promotion strategy.

Furthermore, women who attributed their cancer to biological attributions and stress had higher FCR, independent of optimism. Similarly, women who attributed their cancer to stress had lower well-being regardless of how optimistic they were. This suggests that optimism is not related to a reduction in distress in the case of affected women who endorsed uncontrollable risk factors as causal to their own condition. The sample was reasonably homogeneous in terms of optimism (i.e., 78% of participants had moderate to high optimism scores), which may explain why interactions were not detected. It is noteworthy that significant negative correlations between optimism and endorsement of stress, and optimism and environmental exposures were observed: women who were less optimistic identified more with external attributions as causal.

Moreover, in the present study, it is interesting that results of the bivariate analyses showed that environmental attributions, lifestyle attributions, and other causal attributions identified but not validated by expert consensus were positively correlated with stress. This may indicate that stress is an ambiguous concept that pertains to a wide range of human phenomena and highlights the need to further explore how women affected by cancer define their experience of stress, and how their beliefs about stress impact their views about their cancer and psychological outcomes post-diagnosis. Although the relationship between self-referent attributions and self-efficacy needs further study, it is possible that promoting modifiable lifestyle behaviors to facilitate primary and tertiary prevention of cancer occurrence and recurrence respectively, and assisting women to gain control in the management of their own recovery and survivorship, may result in improved self-efficacy and psychological well-being. It may also lead to positive affect resulting from feelings of empowerment over illness outcomes (Ferrer, Green, & Barrett, 2015). Furthermore, the present study found that attribution of causality to lifestyle risks or chance or bad luck was not associated with the psychological outcomes measured. This is consistent with Weiner's (1984,1985) proposition that the stability of causal attributions is related to expectancy of success, which means that if the causal conditions are perceived as likely to change (e.g., amount of effort expended in making lifestyle changes or the encountered luck), this can consequently lead to positive expectations regarding health outcomes. This may mean that for some women, their beliefs about recurrence prevention may be more relevant to their psychological functioning than their beliefs about what caused their original cancer. In other words, perceptions of the determinants of initial cancer and subsequent recurrence might be different. It is possible that women may also make a distinction between attributions for what caused their breast cancer, and what can prevent breast cancer recurrence, as a way of coping with their fear.

Costanzo et al. (2011) reported that a belief in controllable factors as a way of preventing recurrence was psychologically protective for breast cancer survivors. Moreover, since lifestyle is a risk factor that is modifiable, and chance or bad luck is a factor in which the cause cannot be ascertained, these women may find it easier to bring about behavioral changes needed to reduce subsequent risk compared to women who endorse specific non-modifiable causes.

On the other hand, there may also be a time-associated factor with regards to certain types of attributions. For example, the impact of certain types of causal attributions on psychological outcomes may only be evident immediately after diagnosis, and becomes less significant in the years following diagnosis. This highlights the need for prospective data collection with affected women that tracks perceptions of attributions through time and identifies variables that might predict different trajectories for different types of attributions.

The study's findings should be considered in light of a number of limitations that impact conclusions and implications. It is acknowledged that the homogenous nature of the sample, which may have been a result of the opt-in nature of the recruitment process, limits the generalizability of results. The majority of the women who participated in the study were Caucasian, had a relatively high degree of educational attainment compared to women from the general population, and were likely to be members of a breast cancer, community-based organization, such as Breast Cancer Network Australia. Furthermore, women who were recruited were diagnosed within the last 5 years and the average age of participants was 50 years. The data were collected online, and therefore does not include women who do not use, or do not have access to, the internet. It is possible that causal attributions for breast cancer and subsequent psychological outcomes would differ for those who are older, those who had a longer time since diagnosis, those who come from lower-income families and have less education, and those who come from culturally and linguistically diverse backgrounds.

Furthermore, because data on lifestyle-related health determinants such as BMI, alcohol consumption, or minutes of physical activity engaged in per week, were not collected, this study was also unable to consider the effects that actual lifestyle choices may have on cancer causal attributions to these choices.

Moreover, the cross-sectional nature of the study makes it impossible to determine the direction of causality between attributions and psychological outcomes. For example, it may also be possible that high fear of cancer recurrence and low well-being contribute to type of causal attribution identified (e.g., attribution to stress) instead of type of causal attribution contributing to psychological outcomes. It could also be argued that cancer causal attributions account for a small amount of variance in psychological outcome variables. However, it is important to note that the low regression values does not depreciate the value of attributions as a potential mechanism used by affected women to cope with their breast cancer (Amirkhan, 1998). What this indicates is that attributions are not the sole determinants of affected women’s degree of FCR and psychological well-being and that there is a need to systematically look into situational determinants as well as personality variables that influence attributional categories or patterns.

In order to reduce potential participant burden, attributional dimensions were also not measured in the present study so it was presumed that a biological attribution was perceived as internal, stable, and uncontrollable. Similarly, stress could also be depicted as external, uncontrollable, and stable. However, it is important to highlight that the dimensions for stress are complex and that the attributional pattern of stress is dependent on a particular individual's context.

Notwithstanding these limitations, the strength of this study is that it broadens our understanding of the relationship between causal attributions and FCR and psychological well-being of women with a past diagnosis of breast cancer. Results suggest that health professionals might target psychological support to women who attribute their cancer to biological attributions and stress and have lower optimism. Given the significant relationships between demographic variables, such as age, breast cancer stage at diagnosis, ethnicity and FCR, health professionals may also need to be aware of supportive care needs of affected women who are younger, come from non-English speaking backgrounds and have a more advanced disease stage. Furthermore, because beliefs about lifestyle were not associated with poorer psychological outcomes, cancer prevention messages that are intended to help women meet necessary lifestyle recommendations may help improve their cancer-related self-efficacy as opposed to exacerbating negative affective responses associated with self-blame.

There is a need for future research involving a more diverse sample to examine if attributions interact with other socio-demographic and/or personality variables to predict fear of recurrence and psychological well-being. It may also be of interest to determine associations between attributions of causality and beliefs about recurrence prevention, and subsequent health behaviors, as well as meaning making. Researchers may also want to examine if treatment completion moderates the impact of certain types of attributions on psychological outcomes and whether particular attributions might be more relevant to health and well-being at different stages in the breast cancer survivorship continuum.

Future research could also investigate how women define stress as well as other related concepts that may explain how women perceive stress as a risk attribution for their own breast cancer. There is also a need to further explore how individuals characterize the dimensions of attribution (i.e., locus of causality, stability, and controllability) particularly for stress which is a frequently and strongly endorsed cause of cancer among affected women.

In addition, the impact of attribution to stress on psychological outcomes is an area that could be further explored. As the present study was cross-sectional in nature, it could be that those who have lower psychological well-being scores prior to their diagnosis may be more likely to attribute their cancer to stress (as opposed to attributions of stress leading to lower psychological well-being scores). Moreover, as stress is commonly regarded as a strong risk factor among many women, it may also be of interest to consider measuring the amount of stress that affected women experience, through self-report scales and biological measures (e.g., salivary cortisol as a biomarker of stress) (Antonova et al., 2011; Borders et al., 2010). This would also help validate if women who experience higher levels of stress do attribute their breast cancer to stress. It may also be of interest to determine if there are risk factors that are empirically associated with breast cancer that may be viewed as a stressor by affected women as this may also impact their attitudes towards recovery and survivorship.

Findings of the study suggest that, to a certain extent, personal beliefs about illness causation, particularly biological and stress attributions, have an impact on fear of cancer recurrence and psychological well-being among affected women. The inclusion of cancer causal attributions in interventions aimed to promote positive psychological adaptation among affected women could help identify those who continue to feel the psychological burden associated with their diagnosis, such as those who continue to experience stressors which they feel contributed to the development of their own breast cancer. An understanding of how affected women cope and adjust to their breast cancer, may require a consideration of their understanding and interpretation of what caused their own breast cancer.

Chapter 6
Discussion

The aim of this thesis was to examine how causal attributions among affected (i.e., women with a previous diagnosis of breast cancer) and unaffected women (i.e., women without a previous diagnosis of breast cancer) compare with scientific evidence on risk factors for breast cancer. In addition, attributions between these groups were compared. This thesis also explored whether different causal attributions have a differential impact on measures of psychological sequelae, specifically fear of cancer recurrence and well-being, among affected women.

Review of the Thesis Findings

In Chapter 2, a systematic review of quantitative and qualitative studies that assessed causal attributions for breast cancer among affected women was reported. Comparisons between affected women's attributions and published scientific evidence on risk factors for breast cancer were made. Results from 24 studies that met the inclusion criteria indicated that affected women consistently attributed the cause of their own breast cancer to factors that can be perceived as non-modifiable; family history, environmental factors, stress, and chance. Modifiable lifestyle risk factors were identified less frequently by affected women, despite cancer prevention recommendations highlighting the importance of these factors in controlling and modifying cancer risk.

The observed variations in the findings of the systematic review may have been influenced by the heterogeneity in the different measures used to assess cancer causal attributions across studies. There is no standardized way of measuring causal attributions for breast cancer and thus findings of the systematic review were used to develop a survey to measure causal attributions. The “Beliefs about Breast Cancer Risk Factors" (BBCRF) scale consists of two parts. The first is a 28 causal attribution checklist of items that included risk factors that have been empirically linked with breast cancer as well as anecdotal or common lay explanations for breast cancer reported in causal attribution literature. Women with and without a previous diagnosis of breast cancer (*N* = 474) responded to each item on a five-point scale ranging from 1 (strongly disagree) to 5 (strongly agree). Affected women (*n* = 314) rated each risk factor in relation to their own breast cancer as well as in terms of other women's breast cancer. Unaffected women (*n* = 160) rated each risk factor in terms of whether the item was a risk factor influencing breast cancer in general. The second part of this measure also included open-ended questions which asked women to list factors which they believe may have contributed to the development of their own breast cancer and/or breast cancer of other women.

Chapter 4 investigated if affected women's degree of endorsement of risk factors for breast cancer was influenced by the referent under consideration (i.e., self or other), and compared the degree of endorsement of risk factors for breast cancer between affected and unaffected women. In this study, individual items were grouped according to categories derived from a systematic review of the literature on risk factors for breast cancer (Dumalaon-Canaria et al., 2014). For example, multiple-related items such as age at first menstruation, later age at first pregnancy, never having children, not breastfeeding, use of hormone replacement therapy, and use of oral contraceptives, were classified under the category of "reproductive history, breastfeeding, and hormones." Paired samples *t*-tests were used to test differences in personal (self-referent) and general (other-referent) causal attributions among affected women. Results of Chapter 4, showed that affected women indicated greater endorsement for biological attributions, environmental attributions, reproductive history, breast-feeding, and hormones, lifestyle, and other causal attributions identified but not validated by expert consensus, and smoking when asked to rate the causes of breast cancer in others than when considering their own cancer. Interestingly, affected women reported a similar degree of endorsement for stress and chance, as a cause of their own condition and breast cancer risk generally, despite the lack of scientific evidence for these attributions.

The study presented in Chapter 4 also indicated that when women were asked via an open-ended question to specify factors which they believed contributed to the development of their own and other women's breast cancer, causal attribution to stress continued to be prominent among women for their own condition. Family history of cancer was the most frequently identified cause of breast cancer generally by affected and unaffected women.

Chapter 5 examined the associations between causal attributions for cancer, fear of cancer recurrence and psychological well-being and the possible moderating effect of optimism among affected women. Simultaneous multiple regression analyses were conducted to explore the overall contribution of causal attributions to FCR and psychological well-being separately. Hierarchical multiple regression analyses were also utilized to examine the potential moderating influence of dispositional optimism on the relationship between causal attributions and fear of cancer recurrence and psychological well-being. Affected women's attributions to biological risk factors and stress were associated with greater fear of cancer recurrence. Stress as a causal attribution was also negatively associated with well-being. Optimism did not moderate the relationship between causal attributions and fear of cancer recurrence or well-being. This indicates that attributions to non-modifiable causes, particularly among women who believed that stress caused their own cancer, resulted in greater fear of cancer recurrence and/or lower well-being regardless of how optimistic they were.

Implications

The series of studies presented in this thesis improve the understanding of attributions of causality for breast cancer among women. Attribution is a cognitive process, in which all individuals engage, in an attempt to understand why things happen (Sensky, 1997). Results of the present research confirm that women make cancer causal attributions but that these may not always comply with those promulgated by health authorities. Because the exact cause of an individual's experience of breast cancer cannot usually be identified, inferences about causality are important to consider particularly when they may impact subsequent behavior and psychosocial well-being. Rationalizations of bad experiences help people structure their lives and, in the context of cancer, can help affected women come to terms with a "changed identity" as a cancer survivor (Jefford et al., 2008). Knowing what caused their cancer may enable survivors to make sense of their world and their illness. Their answer to "Why or how did this happen?" may give affected women a way to think about what they need to do to cope, as well as help clarify their roles and responsibilities. As posited in the theory of cognitive adaptation, attributions is a process which may be able to provide a means in which individuals are able to come to accept and find meaning in their diagnosis, allowing them to cope with a sense of control and mastery over their recovery (Taylor, 1983). Successful cognitive adaption may also bring about posttraumatic growth (Calhoun & Tedeschi, 2014; Stanton & Bower, 2015) and restored just-world beliefs, that life is meaningful and fair (Janoff-Bulman, 2004; Park et al., 2008, 2010).

The Influence of Emotions and Experience in the Shaping of Causal Attributions

The work presented in this thesis, particularly results reported in the systematic review (Chapter 2) and Chapter 4 (prevalence of different attributions in women) suggests that affected women have consistently endorsed risk factors that are perceived as non-modifiable such as stress and chance, as causal to their own breast cancer, despite the lack of scientific evidence. As the exact cause of breast cancer for a particular patient cannot be determined, it is possible that affected women may have utilized other sources of information, which may differ from medical opinion, in constructing their beliefs about breast cancer risks. Affected women's cancer causal attributions may have been influenced by their own experiences or by information they obtain outside the medical system including conversations with others and information obtained online. Some women may not be convinced of the link between modifiable risk factors and breast cancer especially if they believe they lived a healthy lifestyle prior to diagnosis. Similarly, affected women who endured a stressful life-event prior to their breast cancer diagnosis may rationalize that stress contributed to the development of their own illness. It is likely that affected women's understanding of risk factors is influenced by contact with other breast cancer survivors with whom many will maintain a close social network. Media coverage that offer "human interest" stories on cancer also have a marked impact on lay perceptions (Henderson & Kitzinger, 1999) and may even serve to misinform (Jones, 2004). All of these sources of information will supplement and potentially override information disseminated by peak bodies.

Affected women's causal attributions and beliefs about risk factors for breast cancer may be influenced by their usual information processing style. Epstein's (1994, 2000, 2003) cognitive-experiential self-theory states that people have two information processing systems, a rational and an experiential system. The rational system operates consciously, relies on logic and reason, and is a system that is relatively free of the effects of emotions. The rational system is intentional and works in a relatively controlled and intentional fashion.

The experiential system operates at a pre-conscious level and makes use of heuristics that contains implicit beliefs about the self and intuitive knowledge about the world that are generalizations derived from emotionally significant experiences. As beliefs involve personal meanings and perceptions, not just the acquisition of factual information or skills, the rational and experiential system can operate interdependently. These two systems can also operate independently, and are heavily influenced by context (Epstein, 2000, 2003).

The experience of being diagnosed with cancer is an emotional experience (Gerbensky-Kerber, 2015). The use of an experiential system may be particularly relevant for affected women, as thinking about what caused their own cancer may also be prompted by the experiential processing system, particularly during the period of diagnosis, when women are trying to make sense of their situation and consequently experience a myriad of emotions. It's possible that the experiential processing may have a greater influence on an individual's reactions and subsequent behavior than logical reason.

Affective responses play an important role in the lives of affected women. For example a number of studies have described the emotional difficulties that affected women experience (Barraclough, 1999; Ganz & Goodwin, 2015; Mehnert & Koch, 2007; Shapiro et al., 2001). Thus, when faced with the need to make sense of their cancer, affected women may have spontaneously identified with causes that served to protect them from experiencing greater distress. According to Roesch and Weiner (2001) causal attributions to an external and non-modifiable cause can result in maintenance of self-esteem. The results from Chapters 2 and 4 showed that lifestyle factors were less frequently endorsed by affected women as a cause of their own condition, despite expert health information highlighting the importance of these factors in controlling and modifying cancer risk. This may mean that affected women acted to protect themselves from any further bad feelings that might arise if they linked their past lifestyle choices to their cancer experience. A rejection of evidence-based attributions for more experiential explanations is consistent with the observation that the latter form of thinking is more probable when the topic under consideration has marked emotional consequences (Epstein, 1994, 2000). This suggests that how affected women view what caused their own cancer may in turn impact how women accept their diagnosis and maintain self-esteem or a positive self-image, which is important for their psychological adjustment(Taylor, 1983; Weinstein, 1989).

It is possible that affected women's personal attributions may reflect another way in which the experiential system shapes women's attributions of causality. As the experiential information processing system has been described as a system that is crude and rapid (Epstein, 1994, 2000), affected women may impulsively associate their diagnosis with particularly stressful and/or uncontrollable life events or circumstances that are in close proximity to their diagnosis as a shortcut in the effort to rationalize their experience. As emotions guide what people notice and remember (Dolan, 2002), attributions may arise through experiential processing of information rather than rational evidence evaluation, prompting people to judge events as causally related, particularly if they are in close temporal proximity (Faro, Leclerc, & Hastie, 2005). Similarly, Slovic, Finucane, Peters, and MacGregor (2004) referred to the experiential system as "risk as feelings" (p. 311) and found that individuals make more use of the experiential system than the logical system in inferring the causes of illness. Future research needs to establish the link between processing strategy and attribution in order to test this hypothesized relationship.

Causal Attributions, Discourses of Individual Responsibility and Ill-health Prevention

The consistent lack of endorsement of modifiable risk factors for breast cancer also suggests that women may inadvertently disagree with discourses of individual responsibility surrounding health when it comes to their own condition. Crossley (2003) posited that the pursuit and maintenance of good health is the responsibility of the individual and is a value that is highly regarded, particularly in Western cultures. Willig (2009) argued that this particular point of view is problematic for those who get sick because it does not allow for the fact that life is, and always will be, "uncertain, unpredictable and (to a large extent) uncontrollable." (p.188). Patients may resist being positioned as responsible for their cancer and this may be evidenced in their views about breast cancer risk. Gibson, Lee, and Crabb (2015) summarized a thematic discourse analysis of Australian women's health and risk talk after the personal experience of being diagnosed with breast cancer. They found that for women who positioned themselves as "always having been at risk" (p.25) of breast cancer, constructed risk as beyond their control and often attributed their cancer to external factors such as stress or genetics. In their study, there were a few women who attributed their cancer diagnosis to past lifestyle choices and those that did, positioned themselves as blameworthy.

For the women in this thesis affected by breast cancer, the consistent endorsement of non-modifiable risk factors may indicate defensiveness. Their beliefs about what caused their own breast cancer may have been influenced by the need to emotionally distance the self from recriminations and self-blame as well as cognitive dissonance. Future research needs to explore the extent to which women feel compelled to justify their own cancer, and their role in causation to others. It is important to note that although the idea of taking responsibility for one's health outcomes may cause distress for some who feel that they should not be blamed for their own diagnosis, being personally accountable for one's health outcomes can also be a strategy of empowerment. The pursuit of ongoing health may play an important role in the survivorship care plan for patients with breast cancer. Being responsible for one's health can take the form of being an educated health consumer who can make healthy lifestyle choices as well as take actions that can alleviate their fears and uncertainty (Gibson et al., 2015).

The Impact of Causal Attributions on Psychological Outcomes

As hypothesized above, for women with a previous diagnosis of breast cancer, ascribing the cause of their own cancer to forces outside of their volition may be a way for them to explain their diagnosis and avoid being blamed for it (Roesch & Weiner, 2001; Gibson et al., 2015). However, it is unclear as to how self-referent attributions of women contribute to differences in psychological outcomes among affected women observed post-treatment or during the period of survivorship (Stanton & Bower, 2015).

The purpose of the study reported in Chapter 5 was to examine the association between cancer causal attributions, fear of cancer recurrence and psychological well-being and the possible moderating effect of optimism among affected women. Results indicated that biological attributions and stress were associated with greater fear of cancer recurrence. As fear of cancer recurrence is a prominent long term concern among breast cancer survivors, with estimates of prevalence varying between 24% and 56% (Mehnert et al., 2009; Simard et al., 2013; van den Beuken-van Everdingen et al., 2008), health professionals may need to provide greater psychological support to affected women who continue to feel emotionally distressed about stressful life-events or circumstances that might be linked to their attributions of causality. Optimism also did not reduce the anxiety of women who endorsed the said risk factors as causal to their own condition and were worried that their cancer could return.

Interestingly, causal attribution to stress was the only attribution variable that was significantly associated with psychological well-being. For affected women who perceived that stressful and uncontrollable life-events or circumstances contributed to the development of their breast cancer, there may be little scope for preventive behaviors to be successfully enacted. Certainly avoidant coping strategies (including denial and disengagement) have been associated with more negative psychological outcomes in affected women in previous research (Carver et al., 1993, 2005). These results are consistent with a model for successful coping with illness that posits that uncontrollable attributions for illness are indirectly linked to negative psychological adjustment through the use of avoidant coping strategies (Roesch & Weiner, 2001), which may further intensify overall stress. The impact of attribution to stress on psychological outcomes is an area that could be further explored in more depth. As the study is cross-sectional in nature, it is possible that affected women who have lower psychological well-being scores prior to their diagnosis may be more likely to attribute their cancer to stress (as opposed to attributions of stress leading to lower psychological well-being scores).

The significant associations found between women's attributions of causality to non-modifiable causes (e.g., stress) and psychological outcomes measured (i.e., FCR and well-being) highlight women's affective responses as well as difficulties in adapting to their cancer. In contrast to Taylor’s (1983) cognitive adaptation theory the search for causes for some could be a struggle, as attribution may be related to negative psychological implications. Some women, particularly those who endorsed non-modifiable causes may be at risk of overall low self-efficacy, which may also be associated with their sense of control. The fatalistic views of women, and possible lack of confidence in managing the consequences of their cancer, may also affect women’s sense of self-mastery potentially contributing to lower self-esteem. It may also be speculated that for some affected women, an attributional search may be unhelpful if they continue to feel distress or vulnerable towards a life-event or circumstance which they feel contributed to their cancer diagnosis and remain unresolved. They may also disagree or resent the idea of finding meaning in their cancer attributions. This would be a fruitful avenue for future research.

It should also be noted that causal attribution to lifestyle factors was not associated with the psychological outcomes measured. This may mean that in the period of survivorship, health messages about lifestyle recommendations as a way of preventing recurrence may be perceived as helpful, as this can help women increase their cancer-related self-efficacy as opposed to exacerbating negative affective responses.

Use of Causal Attributions in Promoting Health among Affected Women

Personal beliefs about illness causation, if linked to actionable attribution, can motivate affected women to make necessary changes in their health behaviors (Costanzo et al., 2011; Leventhal et al., 1997). Affected women who believe that their past lifestyle choices contributed to the development of their cancer may be more likely to believe that they can make necessary lifestyle changes in order to increase their control (Costanzo et al., 2011; Lowery et al., 1993; Taylor, 1983). This may mean that tertiary preventive health behaviors are, at least partly, determined by personal beliefs about illness causation.

Past studies have highlighted the need for effective health interventions that would help women meet lifestyle recommendations. A number of affected women do not engage in physical activity at recommended levels (Pollard, 2011) and only 8% of women actively engage in physical activity throughout the 10 years after diagnosis (Mason et al., 2013). This is despite the finding that women who gain 10% or more body weight after a breast cancer diagnosis may be at higher risk of both recurrence and mortality than women who gain less weight (Goodwin & Boyd, 1990; Kroenke, Chen, Rosner, & Holmes, 2005;

Playdon et al., 2015). Given that physical activity and maintaining a healthy weight are potentially modifiable risk factors for breast cancer, it is important that affected women understand what the scientific evidence says about controllable risks factors for breast cancer, so that they can make informed choices that could reduce their risk recurrence. The research presented in this thesis did not focus on these current health behaviors, however, future research would benefit from examining current lifestyle behaviors in relation to causal attributions and any beliefs related to modifiable risk factors in relation to breast cancer recurrence.

The findings described throughout this thesis highlight the dilemma facing health authorities. Current activities in health promotion that focus on increasing knowledge of lifestyle factors as causal may have limited resonance. Some women may find it difficult to accommodate public health messages designed to educate women about modifiable risk factors and lifestyle approaches to prevention if these contrast with their beliefs about what caused their own cancer. Attributions of causality are complex, and researchers argue that communicating an objective risk assessment from the sole point of view of experts, and treating lay perceptions of risk as inadequate or wrong, are increasingly being recognized as an oversimplification of a complex health issue (Thirlaway & Upton, 2009; Thirlaway & Heggs, 2005).

Health promotion efforts focused on cancer prevention could be further improved by understanding the influence of the experiential information processing system (Epstein, 1994, 2000, 2003) on beliefs that women have about the causes of their own breast cancer. Affected women may be more convinced by health messages if their emotions and previous experiences and how it shapes their cancer causal attributions are taken into account. In this regard, the health message is linked to some aspect of the message recipient’s self and is perceived as personally relevant. This may also increase an individual's motivation and ability to think about tertiary cancer prevention approaches that are communicated by medical experts which may also impact health and well-being. In contrast, when thoughts and feelings about the cancer are not processed adequately, this may result in prolonged intrusive thoughts about the illness and greater psychological distress. This, in turn, may lead to poorer psychological adjustment and an avoidant-passive coping strategy (Schmidt & Andrykowski, 2004).

Screening for Potential Distress via Mapping of Cancer Attributions

The use of attributions in screening for cancer-related distress may help psycho-oncologists identify women who need help in processing their feelings about their own cancer. Consistent with Taylor’s cognitive adaptation theory (1983) some women may need help in answering questions such as, “What does it mean to me to have been diagnosed with cancer?” “How do others see me now that I am a cancer patient? “ Who am I now and how will I live?”(Willig, 2011, p. 901)

Furthermore, affected women have identified the need for greater support in managing fear, suggesting that many cancer services are not currently providing adequate support in this area (Butow, Fardell, & Smith, 2015). Post-treatment, they may be grappling with their worries about recurrence despite having, on average, a better prognosis than many other types of cancer patients (Mehnert et al., 2009; Simard et al., 2013; van den Beuken-van Everdingen et al., 2008). The results reported in Chapter 5 showed that women's causal attributions to biological risk factors and stress were associated with greater fear of cancer recurrence. This suggests that including causal attributions as a risk variable for psychological morbidity is worth considering. Future research should test this possibility.

How can Health Professionals Help Affected Women Deal with Fear of Cancer Recurrence?

Affected women often report that their fear of cancer recurrence increases after active treatment ends (Ganz et al., 2004). The inclusion of causal attributions in the process for screening for fear of cancer recurrence, particularly at the end of primary treatment for breast cancer, may be of value in helping health service providers identify women who need additional support in managing their anxieties about disease progression. This strategy could be delivered as part of the end of treatment case management process or incorporated into cancer support services. Recently, van de Wal et al. (2015) proposed an individualized care for patients with fear of cancer recurrence; for patients with milder fear of cancer recurrence, psycho-education may be sufficient, whereas for those with moderate to high FCR, a therapeutic intervention such as Cognitive Behavioral Therapy (CBT) or Acceptance and Commitment Therapy (ACT) may be more appropriate.

A key concept in CBT is that a person's thoughts have a controlling influence on their emotions and behavior (Wright, Basco, & Thase, 2006). Beck's (1979) cognitive behavioral model emphasized relationships among thoughts, emotions, and behaviors in treatment interventions. He posited that the problem is with one's thinking, and that the practice of CBT involves identifying and modifying maladaptive cognitions. Causal attributions could be considered maladaptive thoughts if they compel women to excessively worry or ruminate about the factors that they believed caused their cancer, particularly for attributions for which there is little or no scientific evidence. These thoughts may also have an impact on their way of coping and attitudes towards recovery.

Fear of cancer recurrence is a distressing emotion maintained by the interpretation of certain events or stimuli (e.g., causal attributions to non-modifiable causes) as potentially threatening or harmful to one’s physical health and well-being (Kaptein et al., 2014; van de Wal et al., 2015). They can be particularly maladaptive if the fear leads to rumination. Montel (2010) presented a case report of a breast cancer survivor who was excessively worried about recurrence of the disease two years after the end of treatment. The patient believed that a perceived conflict with her ill mother-in-law was damaging because it made her feel more stressed, and that this stress could reactivate her breast cancer.

Cognitive restructuring was used so that the patient could re-evaluate her beliefs and tolerate emotions associated with situations she feared. Instead of behaviors such as avoidance, and excessive self-monitoring, the patient was able to identify functional coping strategies such as finding ways to spend quality time with her mother-in-law, and eventually came to realize that her perception of their relationship did not impact her health. This example demonstrates how CBT can help assuage psychological distress associated with causal attributions like stress, particularly for those who experience greater FCR.

Similar effects might be achieved through Acceptance and Commitment Therapy (ACT) where mindfulness and acceptance of cognitions and symptoms that cause fear or worry is a primary aim. ACT supports individuals to be more mindful of the way that they relate with their thoughts and emotions, enabling them to pursue life goals and behavioral changes. Despite differences in treatment approaches (ACT is focused on acceptance and tolerance of thoughts, emotions, and experiences whereas, CBT is focused on changing maladaptive thoughts), both ACT and CBT involve the development of an objective stance toward one’s thoughts, feelings, and behaviors, and enable individuals to cope with their anxiety leading to changes in well-being (Arche & Craske, 2008).

Attributions may also be used in screening for women who may need and desire additional support in addressing cancer-induced existential concerns. Future studies could also look into the relationship between attributions identified and an individual's global meaning system. It is likely that women who attributed their cancer to stress may continue to have higher appraisal of a just world violation which is also associated with greater distress (Janoff-Bulman, 1992; Park et al., 2008; Park, 2010).

Lee, Cohen, Edgar, Laizner, and Gagnon (2006) developed a supportive and therapeutic meaning-making intervention which included tasks such as (1) an appraisal of current emotional and cognitive responses to the cancer diagnosis, (2) an exploration of past significant life events and the influence of past coping strategies on the present cancer experience, and (3) a discussion of life priorities within the context of an acknowledged mortality (p.3137). These tasks were done through a "lifeline" or a story telling approach Participants were able to develop adaptive meanings related to their cancer experience by looking at the influence of old and new assumptions related to their perceptions of self-worth, controllability of events, and beliefs in their distribution of good and bad outcomes in the world. Lee et al., (2006) emphasized that the number of sessions required was tailored to the supportive needs of affected women. For example, women with less need or difficulty in the search for meaning require fewer and shorter sessions; longer and more frequent sessions would be reserved for patients with more complex existential issues. Future research could also aim to explore links between appraisal of the experience of being diagnosed, such as attributions, meaning made, and the profile of affected women who can benefit from meaning making interventions.

In summary, there is a need to sensitize health care providers to the linkage between causal attributions and affective responses and how this might influence women's adaptation to breast cancer. Screening for cancer causal attributions may be an important health promotion strategy; it may help identify women who continue to feel emotionally distressed about stressful life-events or circumstances as a consequence of their attributions of causality. The use of a dual processing model as well as CBT or ACT may provide appropriate strategies for helping affected women manage the anxiety that may arise from cancer causal attributions as these models provide frameworks that take cognition and affect into account. The efficacy of a meaning making intervention could be further explored for women who are unable to benefit from an attributional search of what caused their own breast cancer and have concerns about existential issues related to their own condition.

Further research is needed to identify how these models impact psychological outcomes that are related to particular attributions. Addressing women's affective needs may help them to cognitively reframe their unhelpful habitual modes of thinking, and help women be more receptive to ways in which they can engage in a healthy lifestyle to maintain a sense of control over their recovery. This may help women increase their self-efficacy in managing their cancer, strengthen intrapersonal as well as interpersonal resources, and maintain self-esteem. These strategies reflect how causal attributions can be utilized to help improve survivorship outcomes as well as tertiary cancer prevention strategies. It may be important for future work to determine the effectiveness of these therapies in alleviating fear of cancer recurrence and improving psychological well-being of affected women who continue to feel distressed about specific factors which they believe caused their own breast cancer.

Implications of Causal Attributions for Cancer Prevention in the Broader Population

Findings of this thesis confirm that, in the broader population, breast cancer is largely believed to be caused by genetic, environmental and psychological factors (DiFonzo et al., 2012; Jones et al., 2011; Rabin & Pinto, 2006; Wang et al., 2010). This suggests that modifiable risk factors are not widely recognized by unaffected women, despite cancer prevention messages that are currently promulgated by health experts (Klein & Stefanek, 2007; Slovic, 2010).

Family history of breast cancer was the most highly and frequently endorsed risk factor among unaffected women in both quantitative and qualitative analyses.
It may be of interest to further explore if an overestimation of the relative contribution family history makes in the development of breast cancer leads women without a family history of germline or inherited mutations to discount their vulnerability. As less than 10% of breast cancer cases arise from inherited mutations but are well known in the broader population due to public discourses on *BRCA* mutation testing, mammography and other screenings (Gerbensky-Kerber, 2015), there may need to be greater awareness that most cancers arise from somatic or acquired mutations prompted by a range of factors including health behaviors and lifestyle choices.

Findings of Chapter 4, showed that out of all the potential lifestyle-related causes, women's degree of endorsement was highest for smoking as a risk for breast cancer among women despite there being limited and inconsistent evidence that smoking is linked to breast cancer in comparison to other tobacco-related cancers (IARC, 2012). Moreover, the categorical analysis reported in Chapter 4 showed that affected women without a smoking history were more likely to endorse smoking as a cause of breast cancer in others than those who were current or past smokers (64.2% versus 37.4%, $p < .001$). As a notable proportion of the sample of women reported that they are non-smokers, further research may want to investigate if endorsement of smoking results in discounting personal risk from other lifestyle related risk factors that are linked to breast cancer. On the other hand, smoking was not as frequently identified when an open-ended question format was used compared to when an attribution checklist was used. It is possible that the use of a rating scale may have prompted women to agree more with smoking as a cause of breast cancer compared to other lifestyle related risk factors.

Crabb's (2006) qualitative study of barriers to breast cancer screening and prevention, found that although unaffected women recognize that they are responsible for their health, they also renegotiate their definition of what is healthy and appropriate when talking about their own unhealthy behavior and health risk. For example, unaffected women were aware of risk factors for breast cancer, but argued it would be impossible to follow all health recommendations (Crabb, 2006). This may have been a way for these women to maintain a favorable self-view and not feel guilty about engaging in unhealthy behaviors. In Chapter 4, only a small number of unaffected women identified lifestyle related risk factors as causal to breast cancer. For example, only four women identified the relative contribution of drinking alcohol in the development of breast cancer in the open-ended question format. This suggests that health promotion efforts that are geared towards improving knowledge about risk factors may face significant obstacles in motivating behavior change. There is a need to understand how people respond to health messages and factors that influence causal beliefs, as well as develop strategies that would increase motivation for behavior change among the public.

Results from Chapter 4 also showed that affected women's degree of endorsement of specific risk factors as causal to breast cancer generally was similar to the causal beliefs held within the general population. Affected women were not more likely to endorse evidence-based explanations for breast cancer than unaffected women. A potential implication of this finding is to question whether affected women play a role in shaping how risk factors for breast cancer are interpreted and understood by unaffected women. For example, unaffected women’s beliefs that stress and chance/bad luck cause breast cancer, despite the lack of scientific evidence, may have been derived from listening to the personal narratives of affected family or friends who believed that the said factors caused their cancer or through exposure to these explanations via social and other forms of media.

As the exact cause of an individual’s breast cancer cannot be determined, affected women may endorse a variety of risk factors as causal based from their own past experiences, and knowledge gained from health professionals, popular media, as well as other survivors. Recent research suggests that “cancer rumors” or what lay people say to one another about cancer in conversational contexts may be partly derived from contact with individuals who have a personal history of cancer. Cancer survivors are perceived as credible information sources who share their experiences and beliefs with family members and friends who, in turn, share this unverified information (DiFonzo et al., 2012). This may help shape personal models of cancer causation and perceptions of vulnerability of those without the condition. Thus, unaffected women's understanding of risk may be at least partly learnt vicariously from breast cancer survivors in their immediate social network. Pachur, Hertwig, and Steinmann (2012) described this as an “availability by recall” heuristic, which may be perceived as more convincing than medical opinion.

Further data are required to examine the impact of sense-making by affected women on perceptions of cancer risk factors in the general population. Certainly, there are empirical data to suggest that personal narratives of affected women about their breast cancer experiences have a greater impact on affect and cognition than an informational intervention (McQueen, Kreuter, Kalesan, & Alcaraz, 2011). Berger, Huang, and Rubin (2015) reported that community programs led by affected women are effective in promoting cancer prevention strategies, particularly in improving breast cancer screening rates. Thus, a similar strategy could also be used as a way to engage the general population in meeting lifestyle recommendations. The inclusion of affected women who have received training in communicating and promoting health messages that aim to reduce cancer risk may be an effective peer-led strategy which may be perceived as less threatening than merely acquiring risk information from medical and scientific experts. This would also be less likely to engender avoidance among women in the general population. However, it should be noted that this strategy is reliant on the identification of affected women who endorse cancer prevention recommendations supported by scientific evidence.

Health professionals need to be aware that whenever they communicate information about cancer-related risks, people respond affectively. For public health promotions programs to be effective and persuasive, affective science and its influence on causal beliefs or interpretations of risk factors for breast cancer need to be taken into account (Ferrer et al., 2015; Zikmund-Fisher, Fagerlin, & Ubel, 2010). There may be a need to reframe cancer prevention messages in a positive manner. For example, messages encouraging women to get a mammogram might begin with strong positive images linked to a positive story followed by messages such as, “It’s easy, it’s important, here’s what you should do” (Lang, 2006, p. 68). Positive messages about particular modifiable risk factors for breast cancer may also be employed. For example, Puhl, Peterson, and Luedicke (2013) found that the general public showed greater intention to comply with health media campaigns that aimed to reduce/prevent obesity when the message was focused on health behaviors rather than body weight; they were motivated by positive messages that promoted a healthy lifestyle (e.g., “Eat well. Move more. Live longer”). An interesting finding of this study was that people responded positively to health messages that did not mention the word “obesity” or reference to body weight, even if that was the subject of their campaign. This suggests that messages intended to encourage the public to be healthier may be more effective if framed in helpful ways that increase motivation to engage in health behaviors rather than messages which imply blame or stigma.

In the broader population, it is pertinent to address the need for healthy lifestyle changes in order to reduce the prevalence and impact of cancer. This is important to address in public health because specific lifestyle behaviors that have been found to increase the odds of developing cancer are not diminishing in the population over time, even if these behaviors can be considered modifiable (Spring, King, Pagoto, Van Horn, & Fisher, 2015). The application of the dual processing model (Epstein, 1994, 2000), involvement of affected women, assessment of the content of health messages and awareness of the influence of affect in health communications, might help to address the goals of primary cancer prevention and control.

Limitations

Sampling bias

The research included in this thesis is limited in a number of ways. Participants were recruited from organizations set-up to support affected women and consequently may not be fully representative of the population of breast cancer survivors. Moreover, because data were collected online, women who did not have internet access, or who were unwilling to respond online, were also excluded from data collection. The final threat to generalizability arises from the requirement to be within five years of diagnosis. This requirement was included to alleviate threats to validity associated with poor recollection of causal attributions. The problem it presents are twofold: five years is a significantly long time since diagnosis and recall difficulties may still be present. Secondly, it is likely that attributions for causation change within individuals over time and that the trajectory of these changes is more informative than a simple broad cohort, cross-sectional study. Future research that collects Patient Reported Outcomes prospectively might usefully include the measurement of causal attributions in order to establish stability, or, if appropriate, trajectory of change and predictors thereof.

In this thesis, majority of the participants were around 50 years old, Caucasian, well-educated, and members of BCNA. This is consistent with Gottlieb and Wachala's (2007) critical review of empirical studies on support groups for adults affected by cancer. They found that the demographic characteristics of the participants in the studies reviewed were similar; most were relatively well-educated, white, female, and middle class. Sautier, Mehnert, Hocker, and Schilling (2013) also found that self-help group participation was higher among female cancer patients belonging to a higher social class, which was most likely due to a higher level of healthcare-related information obtained by individuals who belong to a higher income bracket. In this thesis, recruiting women who were members of cancer-related organizations, or were referred by its members, provided a practical strategy for obtaining the number of participants needed to conduct the study, however, the lack of diversity in the sample of women who participated reflects the risk of a systematic sample bias. It is important to note that results of the study may only be generalizable to a population similar in characteristics to the sample included in the thesis. It is possible that causal attributions for breast cancer and subsequent psychological outcomes would differ for those who are older, those who had a longer time since diagnosis, those who come from culturally and linguistically diverse backgrounds, those who come from lower-income families and have less education, and/or those who opt to not participate in or lack access to cancer-related organizations. This study could be further improved by diversifying the characteristics of the sample to decrease sample bias.

Survey demands

Another methodological issue was that extensive pretesting of the main survey instrument was not conducted. It was assumed that the measures were comprehensible to the target population. For example, items of the BBCRF were drawn from the results of a systematic review, therefore the items included were deemed valid because they were derived from previous studies that surveyed women on perceived risk factors or attributions for breast cancer. A pilot test of the survey instrument was conducted prior to data collection, but it involved a very small (*n* = 4; 2 affected and 2 unaffected), and therefore potentially insufficient, number of women.

Pilot testing using a focus group with a larger sample of women may have identified difficulties in interpretation of attributes and utilization of the response scale. Notwithstanding the fact that attributions were identified from the findings of expert panels, utilization of local expertise may have helped in identifying potential critical methodological issues as well as areas for improvement, prior to actual data collection. Testing of the survey with an independent panel with expertise in the area of cancer causation would also have been a useful activity, providing expert insights on proposed attributions.

Demographic and behavioral information not collected

Another limitation of the data analyzed in this thesis is that information on lifestyle behaviors prior to cancer diagnosis (e.g., alcohol consumption, energy dense food consumption) and associated outcomes (e.g., BMI) were not collected. Future studies should collect information on participation in behaviors related to lifestyle attributions; alcohol consumption, energy dense food consumption, sedentary behavior, and physical activity participation. These behaviors may impact the probability of a lifestyle attribution being endorsed; women who participated in behaviors linked to good health may be less likely to attribute these healthy lifestyle factors to personal causation.

The sample in the current study was primarily recruited through the BCNA and it is likely that these women were from an upper socio-economic background and may have had lower lifestyle risk for cancer than the general population. The impact of this may have been to increase the focus on stress as an attribution. This area of inquiry could be further explored if data on personal or lifestyle-related risk factors were collected. Focus groups or interviews with participants to gain a deeper understanding of their responses would also have been useful. For example, lifestyle behaviors may not have been endorsed due to lack of knowledge or because participants were engaged in healthy lifestyle behaviors. Aside from data on lifestyle risk factors, other important factors that were not measured in the questionnaire but which may be relevant to the attributions endorsed are; household income, current employment, medical information on treatments received, and involvement in cancer-related organizations.

Grouping of attributions

In the BBCRF, causal attributions were aggregated by summing similar items under broad or condensed rational categories consistent with the categories used in the systematic review. A limitation of using additive factors is that all items under a given category have equal weights thereby disregarding the different amounts of variability in the observed variables (DiStefano et al., 2009). In the current thesis, biological attributions, which consists of family history of breast cancer, aging, greater breast density, history of benign breast conditions, height, and race, have a Cronbach's α coefficient of .53 for each dataset. The low Cronbach's α coefficient indicates that items in this category may not be closely related as a group. This is evident in the three datasets for this thesis, which showed that majority of women agreed that family history contributed to the development of breast cancer, particularly of other women, but the majority did not agree that height was a risk factor for breast cancer despite epidemiological evidence (AIHW, 2012; WCRF/AICR, 2007). Another possible reason for the low Cronbach's α coefficient is that family history and aging are well known in the broader population compared to the other "biological" risks; breast density, history of benign breast conditions, height, and race. However, a Cronbach's analysis of a "biological" risk factor defined by family history and aging only indicated poor internal consistency. The computed Cronbach's α were: .31, .42, and .27 for affected women's attributions for their own breast cancer and affected and unaffected women's attributions for breast cancer in general respectively. This supported the decision to define "biological" attributions by all of the biological risk factors identified by expert consensus in the systematic review (Chapter 2) despite the low alpha value.

It is also acknowledged that there are other ways of aggregating items that differ from the way the researcher presented the different categories of attributions in the systematic review. For example, environmental causes of cancer may be composed of all non-genetic risk factors that encompass both environment and lifestyle items, instead of treating them as separate categories (Johnson-Thompson & Guthrie, 2000).

Other limitations of the BBCRF

Another limitation of the BBCRF measure was that it did not ask participants to rank how important they believed each risk factor was to the risk of breast cancer. This approach would have required participants to prioritize causes thereby providing more nuanced information on individual differences in attributions, possibly leading to stronger associations between attributions and patient-reported outcomes (i.e., fear of cancer recurrence and psychological well-being). A ranking of importance of attributions is another possible approach although this can be difficult when respondents do not have strong views and the attributes are numerous and differ in subtle ways.

Future research could utilize a different approach to group causal attributions. Weiner (1985, 1986), among others, has demonstrated the potential to define attributes in terms of underlying "characteristics" or dimensions, specifically; locus of causality (i.e., internal, external), stability, and controllability. It is of interest to note the characteristics of attributions endorsed highly in the current study, such as stress, and compare these with items not frequently endorsed but important in cancer prevention, such as lifestyle risk factors. Attribution to stress could be further understood by confirming its dimensions. In addition, examination of respondents' perceptions of the stability and controllability of lifestyle-related risk factors is relevant to understanding likely participation in health promotion programs. However, it is important to keep in mind Russel's (1982) observation that attributions could be ambiguous and may be perceived differently by the attributor and the researcher.

Cross-sectional nature of the study and the associated implications for understanding links to psychological "outcomes"

The cross-sectional nature of the data presented in this thesis makes it impossible to determine the direction of causality between attributions and psychological outcomes. Moreover, although, causal attribution theory provides a framework for understanding the cognitions that influence adaptation to illness (Roesch & Weiner, 2001; Taylor, 1983), the low regression values reported suggest that there are other variables, aside from cancer attributions and optimism, which need to be identified in order to explain fear of cancer recurrence and psychological well-being among affected women. This suggests potential benefit from including other variables, in addition to causal attribution, to understand the psychological impact of a cancer diagnosis, including variables that might moderate or mediate, fully or partially, the impact of attributions.

There may be a need to study other situational determinants and personality variables that might influence attributional patterns. For example, it was not possible to evaluate the difference between self-blame, and the degree of endorsement for lifestyle factors, as a measure of self-blame or stigma were not administered. Measures of locus of control and coping responses could also be utilized to investigate if these psychological variables influence participants' ascriptions of causality. It may also be of interest to compare beliefs about what women think caused their breast cancer as well as cancer recurrence beliefs which may be more relevant to their current health behaviors and psychological functioning. It is possible that although women did not ascribe to lifestyle as a cause they would ascribe lifestyle as a way of preventing cancer recurrence.

Interpretation of stress as a causal attribution

In this thesis, stress was treated as a single-item attribution category, in keeping with previous studies on causal attributions (Ferrucci et al., 2011; Willcox et al., 2011). The BBCRF could also be further revised to include more items that could be aggregated under the construct of stress instead of treating stress as an individual or single-item category.

Casual attribution to stress was widely discussed in the thesis because a majority of affected and unaffected women indicated that stress contributed to the development of their own and/or other women's breast cancer. Causal attribution to stress was also a significant predictor of fear of cancer recurrence and psychological well-being among affected women. In this thesis, stress was conceived as an external and non-modifiable attribution based on the fact that a number of studies included in the systematic review explained causal attribution to stress as exposure to difficult life course events, perceived to be beyond an individual's control. In the qualitative data captured in the BBCRF, a number of women also specifically identified stressful life events they perceived as causal to their own and other women's breast cancer. Nonetheless, it is important to note that there are individual differences with regards to perceptions of control over stress, and stress is a product of both innate and psychosocial factors (Becker et al., 2007; Yehuda, 2006). Stress is likely to be a multi-factorial variable, reflecting both personality differences (e.g., individual differences in neuroticism) as well as differences in exposure to difficult life course events. Similarly, it can be viewed as both a state and trait variable and as modifiable or non-modifiable. Those who engage in stress management strategies may view stress as modifiable and as caused by both external events and internal responses to those events.

Future Research Directions

The findings of this thesis show the potential relevance of cancer causal attributions in the design of health promotional campaigns and public health messages. There is a need to investigate further the type of health communications that can best guide knowledge and attitudes towards cancer prevention in the broader population, as well as strategies that could increase compliance with recommended health behaviors. For example, rigorous evidence is needed to measure the impact of the dual processing model (Epstein, 1994, 2000) on beliefs about risk factors and to evaluate the impact of consumer participation in the dissemination of messages about risk and prevention on believability and perceived relevance. Principles of affective science (Ferrer et al., 2015) may also be used to measure emotional responses and attitudes towards cancer prevention messages. According to Ferrer et al. (2015), there is a need to further understand the basic phenomenological nature of affect, particularly the role of emotional experiences, stress, and mood and how these inform cancer control efforts.

Future work is also needed to investigate if tertiary cancer prevention messages that promote a healthy lifestyle, a modifiable risk factor, help to alleviate fear of cancer recurrence, and increase well-being of affected women. In addition, it may be of value to empirically study causal beliefs of health care practitioners because these may also impact how risk factors are perceived in the broader population. Researchers may want to compare causal attributions within identified groups, such as within families affected by cancer, to confirm if patients and their family members think about risk factors in a similar way. There is also a need to clarify if the strong and consistent identification of stress as causal by both affected and unaffected women is a way for people to identify past unhealthy lifestyle choices made without undue blame.

Future studies could also address other methodological limitations of the present research. Results of the foregoing analyses are best viewed as exploratory and in need of replication to evaluate further the psychometric properties of the BBCRF. A full and more sophisticated validation study for the BBCRF is recommended as a way of further developing and testing the instrument. Future work can help determine the external validity of the BBCRF by studying if it can be generalized across populations, setting, and time. This could include longitudinal research that looks at the relationship between attributions identified by both affected and unaffected women and their subsequent lifestyle choices. A longitudinal study may also determine if attributions change over time and at what stage of the cancer continuum is it most or least relevant.

The BBCRF could also be further evaluated in relation to more representative samples of women with breast cancer. Future studies could examine the type of attributions made by women from other ethnic and racial backgrounds, within and outside Australia, as well as those varying on socio-economic status and other demographic and behavioral differences. Women from different backgrounds may have cultural conceptions of disease that differ from the causal beliefs of Caucasian women which have been more extensively researched. For example, Kwok and White (2011) found that Chinese-Australian women in their sample attributed their breast cancer to their experience of stress associated with their migration to Australia, which may have stemmed from their experience of language barriers and "culture shock". These women also described feeling isolated and coped with their cancer in a fatalistic manner.

Establishing the convergent validity of the BBCRF by correlating scores with those from other measures of attributions is an important next step. Measures that could be used include the Causal Dimension scale (CDS) developed by Russel (1982), which is as a measure of how individuals perceive causes along a series of semantic differential scales representing the dimensions of locus of causality, stability and control. The BBCRF could also be correlated with the Illness Perception Questionnaire-Revised (IPQ-R) (Moss-Morris et al., 2002) which has been previously used in cancer causal attribution studies (Costanzo et al., 2011; Rozema et al., 2009) and measures the five domains of illness representations posited by Leventhal et al., (1997, 2003): identity, consequences, timeline, control/cure and cause. In addition, other established quantitative measures on stress, coping, self-blame or stigma may also be adapted to further understand how these concepts are related to cancer causal attributions. Qualitative methods could also be used to generate greater insights about the said relationships.

Recommendations for Clinical Practice

Findings of the present study suggest that it may be of value to incorporate causal attributions in screening for cancer related-distress. This strategy may help psycho-oncologists and other health professionals identify those likely to experience significant distress and therefore triage women to counseling. Furthermore, health care professionals working with affected women may need to provide greater support for those who attribute their cancer to factors that have limited or no scientific evidence (e.g., stress). Health professionals need to be cognizant of the relationship between causal attributions and affective responses, and how this reaction can potentially influence patient's successful adaptation to their cancer, and subsequent survivorship outcomes. An individualized treatment approach such as CBT, ACT, or a meaning making intervention may be of value to affected women who attribute their cancer to non-modifiable causes and continue to experience fear of cancer recurrence and lower psychological well-being.

In the broader population, health promotion efforts are needed to improve awareness of evidence-based risk factors for breast cancer and support women to make informed lifestyle choices. However, a didactic approach may prove to be insufficient. Health professionals may need to receive training in affective science and methodology such as understanding the nature of emotional experiences, stress, and mood in relation to how it shapes health cognition and behaviors (Ferrer et al., 2015). It is also important for health promotion programs that take into account socio-cultural influences particularly for affected women who come from diverse backgrounds. This could prove to be effective in addressing primary cancer prevention strategies.

Conclusion

Cancer causal attributions are an important dimension of illness cognitions that correlate with affective responses to cancer and ways of coping. One problem that remains is that there continues to be a disparity between expert opinion about risk factors for breast cancer and the breast cancer attributions and beliefs of women. Results presented in this thesis highlight the use of causal attributions in helping to improve cancer prevention messages. They also show the potential value of using causal attributions as a tool to help identify affected women who may have a need for greater psychosocial support in managing the physical and psychological consequences of their cancer. Future research is required to validate these suggestions.

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Appendix A

Recruitment Materials

Carlene Wilson
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Dear Madam,

This letter is to introduce, Ms. Jo Anne Dumalaon, who is a research student in the School of Medicine at Flinders University. She is undertaking research leading to a thesis and publications on the subject of causal attributions and beliefs about the causes of breast cancer. She is examining the opinions of both breast cancer survivors and women from the general population.

Jo Anne would be most grateful if you would volunteer to assist in this project, by completing a short 15 minute online questionnaire about different things that may or may not cause breast cancer. Breast cancer survivors will also be asked some additional questions on psychological well-being which may take another 10 minutes. No more than 30 minutes of your time would be required in total.

Be assured that any information provided will be treated in the strictest confidence and none of the participants will be individually identifiable in the resulting thesis or other publications. Upon completing the online questionnaire, your data will be sent to a secure, password protected server that can only be accessed by the researchers. You are of course, free to discontinue participation at any time or to decline to answer particular questions.

If you are interested in participating in this study, please click on this link to access the survey: https://www.surveymonkey.com/s/JW7P5L6

If you know anyone else who may be interested in participating in this study, please forward this email to them.

If you have any questions about this project please contact the researcher’s supervisor: Carlene Wilson (phone: 7221 8473, or email carlene.wilson@flinders.edu.au) or the researcher Jo Anne Dumalaon (email duma0005@flinders.edu.au).

Thank you for your attention and assistance.

Carlene Wilson

Yours sincerely

Prof Carlene Wilson
CCSA Chair in Cancer Prevention (Behavioural Research)
School of Medicine
Flinders University

INFORMATION SHEET

Title: An investigation into breast cancer survivors' and the general populations' beliefs about the causes of breast cancer

Researchers:

Ms. Jo Anne Dumalaon is a research student at Flinders Centre for Innovation in Cancer at Flinders University. She has a strong interest in breast cancer research and her current research is on beliefs that women have about the risk factors for breast cancer. She is supervised by Professor Carlene Wilson, Cancer Council SA Chair of Cancer Prevention, and post-doctoral fellows Dr. Amanda Hutchinson and Dr. Ivanka Prichard.

Description of the study:

This project aims to examine causal beliefs about the causes of breast cancer among women who have been previously diagnosed with breast cancer and unaffected women from the general population.

In addition, this research also aims to determine relationships between the type of beliefs about the cause of cancer and psychological well-being, optimism, and concerns about cancer recurrence among women with breast cancer. Results of this study may help to understand how causes of breast cancer are perceived and help in the provision of breast cancer information.

Is this project right for me?

The researcher is seeking 1) females who have been previously diagnosed with breast cancer within the last 5 years, 18 years old and above and 2) females in the general population with no prior personal history of breast cancer 25 years old and above.

What will I be asked to do?

You will be asked to complete a short 15 minute online questionnaire about different things that may or may not cause breast cancer.

Breast cancer survivors will also be asked some additional questions on psychological well-being, optimism, and concerns about cancer recurrence which may take another 15 minutes. No more than 30 minutes of your time will be required in total.

What benefit will I gain from being involved in this study?

This research will benefit the community by leading to a better understanding of the beliefs women hold about the causes of breast cancer and their impact on cancer survivors' well-being.

Will I be identifiable by being involved in this study?

You will not be identifiable. No identifying information will be requested, and therefore the data will be anonymous and confidential.

Are there any risks or discomforts if I am involved?

The researchers anticipate few risks from your involvement in this study. If you have any concerns regarding anticipated or actual risks or discomforts, please raise them with the researchers.

You may also contact Cancer Council Helpline which is a free and confidential service. They can help you with your concerns or inquiries regarding a wide range of issues related to cancer.

Their contact information is.
Cancer Council Helpline
Ph: 13 11 20
Website: http://www.cancer.org.au/about-cancer/patient-support/

How do I agree to participate?

Participation is voluntary. You may refuse to answer any questions and you have the right to withdraw participation at any time during the study.

How will I receive feedback?

Outcomes from the project will be summarised and provided by the researcher if you would like to see them.

Thank you for taking the time to read this information sheet and we hope that you will accept our invitation to be involved.

This research project has been approved by the Flinders University Social and Behavioural Research Ethics Committee (Project number 6176) .For more information regarding ethical approval of the project the by email human.researchethics@flinders.edu.au

Appendix B

Survey Questionnaires

Demographic Information

Please answer the following questions about yourself and your background:

1. Please specify your current age (years): ☐ (years)
2. What is the highest level of formal education that you have completed? (Tick one box)
   - ☐ University qualification
   - ☐ TAFE or technical qualification
   - ☐ Secondary School
   - ☐ Primary School
3. Please indicate your cultural/ethnic background: (Tick one box)
   - ☐ Caucasian
   - ☐ Asian
   - ☐ African
   - ☐ Australian Indigenous
   - ☐ Other (please specify): ☐
4. What is your current marital status? (Tick one box)
   - ☐ Married
   - ☐ Separated
   - ☐ De-facto relationship
   - ☐ Single/never married
5. Have you ever been a regular smoker? (Tick one box)
   - ☐ Yes
   - ☐ No
6. Have any of your *first* degree relatives (e.g., mother, father, brother, sister) been diagnosed with breast cancer?
   - ☐ Yes
   - ☐ No
   - ☐ Don't know
7. Have you ever been diagnosed with breast cancer?
   - ☐ Yes
   - ☐ No
8. If yes, please specify stage at diagnosis.
   - ☐ In situ or localized
   - ☐ Regional
   - ☐ Distant
9. If yes, please specify age at diagnosis. ☐

For unaffected women with no prior history of breast cancer

Beliefs about the Causes of Breast Cancer Study

Part A

We are interested in your views about the factors that you believe cause breast cancer. Below is a possible list of causes. Please indicate the extent to which you agree that a particular factor increases the chances of a person being diagnosed with breast cancer. Please note, there are no right or wrong answers, simply answer to the best of your own knowledge.

1- Strongly Disagree
2- Disagree
3- Neither Disagree or Agree
4- Agree
5- Strongly Agree

1	A family history of cancer	1	2	3	4	5
2	Aging	1	2	3	4	5
3	Greater breast density (a greater amount of breast and connective tissue compared to fat)	1	2	3	4	5
4	History of benign breast conditions (non-cancerous breast disorders)	1	2	3	4	5
5	Height (e.g., being tall)	1	2	3	4	5
6	A person’s race/ethnicity	1	2	3	4	5
7	Previous injury or trauma to the breast	1	2	3	4	5
8	Air pollution	1	2	3	4	5
9	Type of occupation	1	2	3	4	5
10	Exposure to pesticides/chemicals	1	2	3	4	5
11	Exposure to radiation	1	2	3	4	5
12	Exposure to secondhand smoke	1	2	3	4	5
13	Age at first menstruation	1	2	3	4	5
14	Use of hormonal replacement therapy	1	2	3	4	5
15	Never having children	1	2	3	4	5

16	Later age at first pregnancy	1	2	3	4	5
17	Not breastfeeding	1	2	3	4	5
18	Use of oral contraceptives	1	2	3	4	5
19	Being overweight or obese	1	2	3	4	5
20	Drinking alcohol	1	2	3	4	5
21	Lack of exercise	1	2	3	4	5
22	Poor dietary habits	1	2	3	4	5
23	Smoking	1	2	3	4	5
24	Fate/destiny	1	2	3	4	5
25	God’s plan	1	2	3	4	5
26	Chance or bad luck	1	2	3	4	5
27	Stress	1	2	3	4	5
28	Personality type	1	2	3	4	5

Part B

If you would like to, please tell us what factors you believe may have contributed to the development of breast cancer in other women, if any?

____

____

For affected women with a previous diagnosis of breast cancer

Beliefs about the Causes of Breast Cancer Study

Part A

We are interested in your views about the factors that may have caused breast cancer. Below is a possible list of causes of breast cancer. For each item, please indicate the extent to which you agree or disagree that a particular factor may have contributed to your own breast cancer and whether you believe a particular factor increases the chances of a person being diagnosed with breast cancer in general. Please note, there are no right or wrong answers, simply answer to the best of your own knowledge.

1- Strongly Disagree
2- Disagree
3- Neither Disagree or Agree
4- Agree
5- Strongly Agree

1	A family history of cancer	Your Cancer	1	2	3	4	5
		Breast Cancer in General	1	2	3	4	5
2	Ageing	Your Cancer	1	2	3	4	5
		Breast Cancer in General	1	2	3	4	5
3	Greater breast density (a greater amount of breast and connective tissue compared to fat)	Your Cancer	1	2	3	4	5
		Breast Cancer in General	1	2	3	4	5
4	History of benign breast conditions (non-cancerous breast disorders)	Your Cancer	1	2	3	4	5
		Breast Cancer in General	1	2	3	4	5
5	Height (e.g., being tall)	Your Cancer	1	2	3	4	5
		Breast Cancer in General	1	2	3	4	5
6	A person’s race/ethnicity	Your Cancer	1	2	3	4	5

		Breast Cancer in General	1	2	3	4	5
7	Previous injury or trauma to the breast	Your Cancer	1	2	3	4	5
		Breast Cancer in General	1	2	3	4	5
8	Air pollution	Your Cancer	1	2	3	4	5
		Breast Cancer in General	1	2	3	4	5
9	Type of occupation	Your Cancer	1	2	3	4	5
		Breast Cancer in General	1	2	3	4	5
10	Exposure to pesticides/chemicals	Your Cancer	1	2	3	4	5
		Breast Cancer in General	1	2	3	4	5
11	Exposure to radiation	Your Cancer	1	2	3	4	5
		Breast Cancer in General	1	2	3	4	5
12	Exposure to secondhand smoke	Your Cancer	1	2	3	4	5
		Breast Cancer in General	1	2	3	4	5
13	Age at first menstruation	Your Cancer	1	2	3	4	5
		Breast Cancer in General	1	2	3	4	5
14	Use of hormonal replacement therapy	Your Cancer	1	2	3	4	5
		Breast Cancer in General	1	2	3	4	5
15	Never having children	Your Cancer	1	2	3	4	5

		Breast Cancer in General	1	2	3	4	5
16	Later age at first pregnancy	Your Cancer	1	2	3	4	5
		Breast Cancer in General	1	2	3	4	5
17	Not breastfeeding	Your Cancer	1	2	3	4	5
		Breast Cancer in General	1	2	3	4	5
18	Use of oral contraceptives	Your Cancer	1	2	3	4	5
		Breast Cancer in General	1	2	3	4	5
19	Being overweight or obese	Your Cancer	1	2	3	4	5
		Breast Cancer in General	1	2	3	4	5
20	Drinking alcohol	Your Cancer	1	2	3	4	5
		Breast Cancer in General	1	2	3	4	5
21	Lack of exercise	Your Cancer	1	2	3	4	5
		Breast Cancer in General	1	2	3	4	5
22	Poor dietary habits	Your Cancer	1	2	3	4	5
		Breast Cancer in General	1	2	3	4	5
23	Smoking	Your Cancer	1	2	3	4	5
		Breast Cancer in General	1	2	3	4	5
24	Fate/destiny	Your Cancer	1	2	3	4	5

		Breast Cancer in General	1	2	3	4	5
25	God’s plan	Your Cancer	1	2	3	4	5
		Breast Cancer in General	1	2	3	4	5
25	Chance or bad luck	Your Cancer	1	2	3	4	5
		Breast Cancer in General	1	2	3	4	5
27	Stress	Your Cancer	1	2	3	4	5
		Breast Cancer in General	1	2	3	4	5
28	Personality type	Your Cancer	1	2	3	4	5
		Breast Cancer in General	1	2	3	4	5

Part B:

1. If you would like to, please tell us what factors, you believe may have greatly contributed to the development of your breast cancer, if any?’

2. If you would like to, please tell us what factors, you believe may have greatly contributed to the development of breast cancer in other women, if any?’

The Psychological General Well-Being Index

This survey contains questions about how you feel and how things have been going with you *during the past month.* For each question check the answer which best applies to you.

How have you been feeling in general?

5 ☐ In excellent spirits
4 ☐ In very good spirits.
3 ☐ In good spirits mostly
2 ☐ I have been up and down in spirits a lot
1 ☐ In low spirits mostly
0 ☐ In very low spirits

How often were you bothered by any illness, bodily disorder, aches or pains?

0 ☐ Every day
1 ☐ Almost every day
2 ☐ About half of the time
3 ☐ Now and then, but less than half the time
4 ☐ Rarely
5 ☐ None of the time

Did you feel depressed?

0 ☐ Yes-to the point that I felt like taking my life
1 ☐ Yes-to the point that I did not care about anything
2 ☐ Yes-very depressed almost every day
3 ☐ Yes-quite depressed several times
4 ☐ Yes-a little depressed now and then
5 ☐ No-never felt depressed at all

Have you been in firm control of your behaviour, thoughts, emotions, or feelings?

5 ☐ Yes, definitely so
4 ☐ Yes, for the most part
3 ☐ Generally so
2 ☐ Not too well
1 ☐ No, and I am somewhat disturbed
0 ☐ No, and I am very disturbed

Have you been bothered by nervousness or your "nerves"?

0 ☐ Extremely so-to the point where I could not work or take care of things
1 ☐ Very much so
2 ☐ Quite a bit
3 ☐ Some-enough to bother me
4 ☐ A little
5 ☐ Not at all

How much energy, pep, or vitality did you have or feel?

5 ☐ Very full of energy-lots of pep
4 ☐ Fairly energetic most of the time
3 ☐ My energy level varied quite a bit
2 ☐ Generally low in energy or pep
1 ☐ Very low in energy or pep most of the time
0 ☐ No energy or pep at all- I felt drained, sapped

I felt downhearted and blue.

5 ☐ None of the time
4 ☐ A little of the time
3 ☐ Some of the time
2 ☐ A good bit of the time
1 ☐ Most of the time
0 ☐ All of the time

Were you generally tense- or did you feel any tension?

0 ☐ Yes- extremely tense, most or all of the time
1 ☐ Yes- very tense most of the time
2 ☐ Not generally tense, but did feel fairly tense several times
3 ☐ I felt a little tense a few times
4 ☐ My general tension level was quite low
5 ☐ I never felt tense or any tension at all

How happy, satisfied, or pleased have you been with your personal life?

5 ☐ Extremely happy- could not have been more satisfied or pleased
4 ☐ Very happy most of the time
3 ☐ Generally satisfied- pleased
2 ☐ Sometimes fairly happy, sometimes fairly unhappy
1 ☐ Generally dissatisfied, unhappy
0 ☐ Very dissatisfied or unhappy most or all the time

Did you feel healthy enough to carry out the things you like to do or had to do?

5 ☐ Yes -definitely so
4 ☐ The most part
3 ☐ Health problems limited me in some important ways
2 ☐ I was only healthy enough to take care of myself
1 ☐ I needed some help in taking care of myself
0 ☐ I needed someone to help me with most or all of the things I had to do

Have you felt so sad, discouraged, hopeless, or had so many problems that you wondered if anything was worthwhile?

0 ☐ Extremely so -to the point that I have just about given up
1 ☐ Very much so
2 ☐ Quite a bit
3 ☐ Some -enough to bother me
4 ☐ A little bit
5 ☐ Not at all

I woke up feeling fresh and rested.

0 ☐ None of the time
1 ☐ A little of the time
2 ☐ Some of the time
3 ☐ A good bit of the time
4 ☐ Most of the time
5 ☐ All of the time

Have you been concerned, worried, or had any fears about your health?

0 ☐ Extremely so
1 ☐ Very much so
2 ☐ Quite a bit
3 ☐ Some, but not a lot
4 ☐ Practically never
5 ☐ Not at all

Have you had any reason to wonder If you were losing your mind, or losing control over the way you act, talk, think, feel or of your memory?

5 ☐ Not at all
4 ☐ Only a little
3 ☐ Some -but not enough to be concerned or worried about
2 ☐ Some and I have been a little concerned
1 ☐ Some and I am quite concerned
0 ☐ Yes, very much so and I am very concerned

My daily life was full of things that were interesting to me.

0 ☐ None of the time
1 ☐ A little of the time
2 ☐ Some of the time
3 ☐ A good bit of the time
4 ☐ Most of the time
5 ☐ All of the time

Did you feel active, vigorous, or dull, sluggish?

5 ☐ Very active, vigorous every day
4 ☐ Mostly active, vigorous -never really dull, sluggish
3 ☐ Fairly active, vigorous-seldom dull, sluggish
2 ☐ Fairly dull, sluggish-seldom active, vigorous
1 ☐ Mostly dull, sluggish-never really active, vigorous
0 ☐ Very dull, sluggish every day

Have you been anxious, worried, or upset?

0 ☐ Extremely so- to the point of being sick or almost sick
1 ☐ Very much so
2 ☐ Quite a bit
3 ☐ Some- enough to bother me
4 ☐ A little bit
5 ☐ Not at all

I was emotionally stable and sure of myself.

0 ☐ None of the time
1 ☐ A little of the time
2 ☐ Some of the time
3 ☐ A good bit of the time
4 ☐ Most of the time
5 ☐ All of the time

Did you feel relaxed, at ease or high strung, tight, or keyed-up?

5 ☐ Felt relaxed and at ease the whole month
4 ☐ Felt relaxed and at ease most of the time
3 ☐ Generally felt relaxed but at times felt fairly high strung
2 ☐ Generally felt high strung but at times felt fairly relaxed
1 ☐ Felt high strung, tight, or keyed up most of the time
0 ☐ Felt high strung, tight, or keyed up the whole month

I felt cheerful, light-hearted.

0 ☐ None of the time
1 ☐ A little of the time
2 ☐ Some of the time
3 ☐ A good bit of the time
4 ☐ Most of the time
5 ☐ All of the time

I felt tired, worn out, used up, or exhausted

5 ☐ None of the time
4 ☐ A little of the time
3 ☐ Some of the time
2 ☐ A good bit of the time
1 ☐ Most of the time
0 ☐ All of the time

Have you been under or felt you were under any strain, stress, or pressure?

0 ☐ Yes, almost more than I could bear or stand
1 ☐ Yes, quite a bit of pressure
2 ☐ Yes, some-more than usual
3 ☐ Yes, some-but about usual
4 ☐ Yes, a little
5 ☐ Not at all

Revised Life Orientation Test

Please be as honest and accurate as you can throughout. Try not to let your response to one statement influence your responses to other statements. There are no "correct" or "incorrect" answers. Answer according to your own feelings, rather than how you think "most people" would answer.

0- Strongly disagree
1- Disagree
2- Neutral
3- Agree
4- Strongly agree

1.	In uncertain times, I usually expect the best.	0	1	2	3	4
2.	It's easy for me to relax.[a]	0	1	2	3	4
3.	If something can go wrong for me, it will.[b]	0	1	2	3	4
4.	I'm always optimistic about my future.	0	1	2	3	4
5.	I enjoy my friends a lot. [a]	0	1	2	3	4
6.	It's important for me to keep busy [a]	0	1	2	3	4
7.	I hardly ever expect things to go my way.[b]	0	1	2	3	4
8.	I don't get upset too easily. [a]	0	1	2	3	4
9.	I rarely count on good things happening to me.[b]	0	1	2	3	4
10.	Overall, I expect more good things to happen to me than bad	0	1	2	3	4

[4]

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[4] [a]Filler items
[b]Items that are reverse coded

The Concerns about Recurrence Scale

The following questions ask you to tell us about any worries you may have about the possibility of breast cancer recurrence. By recurrence we mean the breast cancer coming back in the same breast or another area of the body, or a new breast cancer in either breast. Although most women who have been diagnosed with early stage breast cancer will never have another problem with the cancer, we are aware that many women do worry about this possibility. Other women may not worry about recurrence at all. Either way, your answers to these questions are very important to us. We understand that it may be upsetting to think about or answer questions about the possibility of recurrence. However, we need your help to understand how women think about this possibility.

For the following four questions please circle the number that comes closest to the way you feel. For example, for the first question you should circle "1" if you don't think about recurrence at all, circle "6" if you think about recurrence all the time, or circle "2", "3", "4" or "5" if the amount of time you spend thinking about recurrence is somewhere in between.

1. How much time do you spend thinking about the possibility that your breast cancer could recur?

1	*2*	*3*	*4*	*5*	*6*
I don't think about it at all					*I think about it all the time*

2. How much does the possibility that your breast cancer could recur upset you?

1	*2*	*3*	*4*	*5*	*6*
It does not upset me at all					*It makes me extremely upset*

3. How often do you worry about the possibility that your breast cancer could recur?

1	*2*	*3*	*4*	*5*	*6*
I never worry					*I worry about it all the time*

4. How afraid are you that your breast cancer may recur?

1	*2*	*3*	*4*	*5*	*6*
Not all afraid					*Very afraid*

Appendix C

Published Paper

Authorship Declaration

Dumalaon-Canaria, J. A., Hutchinson, A. D., Prichard, I., & Wilson, C. (2014). What causes breast cancer? A systematic review of causal attributions among breast cancer survivors and how these compare to expert-endorsed risk factors. *Cancer Causes Control*, 25(7), 771-785 doi: 10.1007/s10552-014-0377[5]

Location in thesis: This paper is Chapter 2 of this thesis.

Contributions: Dr. Amanda Hutchinson, Dr. Ivanka Prichard, and Prof Carlene Wilson acted in a supervisory capacity and guided all stages of this research and manuscript preparation. I was responsible for this study's inception and design, development of the search strategy, data collection, statistical analyses, and data interpretation. I am also the primary author of this paper and was responsible for manuscript preparation, revision, and communication with journal editor.

The undersigned agree that the statements made regarding author contributions are accurate and true.

Signed: Jo Anne Dumalaon Date: ______1 February 2017______

Signed: Prof. Carlene Wilson Date: ______1 February 2017 _____

Signed: Dr. Amanda Hutchinson Date: ______1 February 2017______

Signed: Dr. Ivanka Prichard Date: ______1 February 2017 ______

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