

# Stuck in the spin cycle: Avoidance and intrusions following breast cancer diagnosis

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**Objectives.** Theories and research regarding cognitive and emotional processing during the experience of profound stressors suggest that the presence of intrusive thoughts and feelings predicts greater use of avoidance and that the use of avoidance paradoxically predicts more intrusions. However, empirical investigations of their purported bidirectional relationship are limited.

**Design.** This study presents a longitudinal investigation of the reciprocal relationship between intrusions and avoidance coping over a 6-month period in the year following breast cancer diagnosis.

**Methods.** Breast cancer patients ( $N = 460$ ) completed measures of cancer-related intrusions and avoidance at study entry, 3 months, and 6 months later (i.e., an average of 2, 5, and 8 months after diagnosis, respectively).

**Results.** Cross-lagged panel analyses revealed that intrusive thoughts, feelings, and images at study entry predicted greater avoidance 3 months later, and avoidance coping at study entry predicted intrusions 3 months later, controlling for the stability of intrusions and avoidance as well as time since diagnosis. Findings were not statistically significant for avoidance predicting intrusions, or vice versa, between the 3-month and the 6-month assessment period, during which they declined.

**Conclusions.** These findings provide empirical support for the theoretical contention that avoidance and intrusive thoughts and emotions reciprocally influence one another following stressful events. Additionally, in the months shortly after breast cancer diagnosis, intrusions and avoidance are positively related. However, the relationships attenuate over time, which could indicate resolved cognitive and emotional processing of the cancer experience.

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## Statement of contribution

### *What is already known on this subject?*

Following stressful life events, individuals often experience intrusive thoughts and feelings related to the event and they report avoidance of such reminders. Many studies demonstrate that greater intrusions predict more subsequent use of avoidance coping, and other studies show that greater use of avoidance predicts more intrusions. Their reciprocal relation has not been examined, however.

### *What does this study add?*

- This is the first examination of the concurrent, reciprocal influence of intrusions and avoidance.
- Findings suggest that accounting for the bidirectional influence of avoidance and intrusions best estimates hypothesized models.
- Higher intrusions and avoidance predicted each other for the first 3 months after study entry, but the relationship diminished 6 months after study entry, perhaps due to productive mental processing of the stress of breast cancer diagnosis and treatment.

Cognitive and emotional processing models of adjustment to stressful experiences posit that a critical component of psychological recovery from a life-disrupting event is mental processing and integration of the event into one's schema about the self and the world (Horowitz, 1986; Janoff-Bulman, 1989; Stanton & Low, 2012). The enduring presence of intrusive thoughts, feelings, and images about the stressor and use of avoidance-oriented coping are thought to indicate incomplete cognitive and emotional processing of the stressor (Baum, Cohen, & Hall, 1993). It is theorized that mental processing of stressors involves rotating cycles of avoidance and intrusive thoughts and feelings (Horowitz, 1986). Phases of intrusive thoughts and feelings are characterized by stressor-related ideas and emotions (referred to as intrusions throughout the remainder of the paper) that come to mind for eventual integration. Denial, withdrawal, suppressing stressor-related thoughts, and emotional numbing typify phases of avoidance. Theoretically, intrusions and avoidance occur until unwanted stressor-related cognitions and emotions resolve (Horowitz, 1986; Horowitz & Solomon, 1975; Janoff-Bulman, 1989). However, empirical tests of how avoidance and intrusions mutually influence one another over time have yet to be conducted. This study investigates the bidirectional relationship of intrusions and avoidance-oriented coping over a 6-month study period in the year following breast cancer diagnosis.

Although Horowitz (1986) acknowledges that phases of avoidance and phases of intrusions can co-occur, he theorizes that the presence of intrusions can trigger the use of avoidance coping. That is, when distress from intrusions becomes too great, a person can enter a period of avoidance to prevent becoming overwhelmed by the intrusions. Empirical literature supports this theorized positive influence of intrusions on avoidance in individuals experiencing profound stress. For example, in firefighters who were exposed to brushfires, greater intensity of intrusions about the brushfires predicted greater use of avoidance coping (McFarlane, 1992). In a sample of individuals with heterogeneous types of cancer who were receiving active medical treatment, greater intrusions at study entry predicted an increase in avoidance coping 3 months later (Manne, Glassman, & DuHamel, 2001). Taken together, both theory and empirical findings suggest that the presence of intrusions predicts subsequently greater use of avoidance coping.

Although Horowitz (1982) does not make specific assertions about whether avoidance predicts later intrusions, he suggests that individuals engage in avoidance when they are overwhelmed by intrusions, suggesting that avoidance coping may palliate intrusions. However, a series of experimental studies conducted by Wegner and

others indicate that actively suppressing unwanted thoughts paradoxically increases later intrusive thoughts about the previously avoided subject (Salkovskis & Campbell, 1994; Wegner, Schneider, Carter, & White, 1987; Wegner, Shortt, Blake, & Page, 1990). Although replication of Wegner and colleagues' findings is mixed and vary as a function of methodological differences (Abramowitz, Tolin, & Street, 2001), descriptive studies conducted in individuals who experienced traumatic and chronic stressors support Wegner's experimental findings. Following burn injury, greater self-reported avoidance at discharge from the hospital predicted an increase in intrusions 4 months later (Lawrence, Fauerbach, & Munster, 1996); and in a sample of socioeconomically disadvantaged Latinas with breast cancer, greater self-reported avoidance of cancer-related thoughts and feelings at study entry predicted an increase in intrusions 3 months later (Moreno *et al.*, 2016). Thus, empirical findings suggest that the use of avoidance prevents mental processing of stressful experience and may increase, rather than palliate, intrusions.

Despite the mixed evidence for the temporal ordering of intrusions and avoidance, empirical examination of the purported bidirectional relationship between intrusions and avoidance is limited. Cross-sectional studies examining the relationship between avoidance and intrusions following trauma (e.g., Bryant & Harvey, 1995) and in individuals with cancer (e.g., Brewin, Watson, McCarthy, Hyman, & Dayson, 1998; Cordova *et al.*, 1995; Epping-Jordan, Compas, & Howell, 1994) support a positive correlation between avoidance and intrusions. However, most longitudinal studies of intrusions and avoidance assess avoidance as a predictor of intrusions, or intrusions as a predictor of avoidance, but do not examine bidirectional relations.

Examining the potential bidirectional relationship between avoidance and intrusions will help clarify processes that underlie cognitive and emotional adaptation to stress. Models of mental processing of stressful life events suggest that avoidance and intrusions are present until cognitive and emotional processing of the stressful experience occurs (Horowitz, 1986; Janoff-Bulman, 1989; Stanton & Low, 2012), suggesting that over time avoidance and intrusion should decline. The reciprocal influence of avoidance and intrusions could maintain one another over time until cognitive and emotional processing is successful; this contention has yet to be tested empirically. Understanding the relationship between avoidance and intrusions over several months could elucidate for how long intrusions and avoidance influence one another and whether their relationship diminishes over time. Although cycles of avoidance and intrusions can be part of normative processing of stressful experiences, research suggests that protracted avoidance and intrusions can negatively influence quality of life (Dupont, Bower, Stanton, & Ganz, 2014; Primo *et al.*, 2000; Stanton & Snider, 1993).

The common occurrence of intrusions and avoidance for women with breast cancer renders this group an important target for study (Cordova *et al.*, 1995; Primo *et al.*, 2000). The rate of moderate to severe intrusions ranges from 21% to 48% (Bleiker, Pouwer, van der Ploeg, Leer, & Ader, 2000; Jim, Andrykowski, Munster, & Jacobsen, 2007). Experiencing intrusions puts individuals with cancer at risk for worsening psychological adjustment and physical symptoms over time (Devine, Parker, Fouladi, & Cohen, 2003; Dupont *et al.*, 2014). Although women with breast cancer often report use of avoidance-oriented coping at low levels, even low levels of avoidance coping predict an increase in psychological distress (Carver *et al.*, 1993; Stanton & Snider, 1993) and more bothersome physical symptoms (Bauer *et al.*, 2016) during breast cancer diagnosis and treatment. Some research suggests that avoidance also predicts cancer progression (Chida, Hamer,

Wardel, & Steptoe, 2008; Epping-Jordan *et al.*, 1994). Avoidance and intrusions also have been suggested as risk factors for psychopathology in women with breast cancer (e.g., anxiety, depression, PTSD; Brewin *et al.*, 1998; Cordova *et al.*, 1995; Whitaker, Brewin, & Watson, 2008). Given the deleterious outcomes associated with intrusions and avoidance, understanding how they are maintained during the first year following a breast cancer diagnosis is important.

The purpose of the proposed study was to examine bidirectional associations between intrusions and avoidance and to investigate how these associations change over a 6-month study period in the year following breast cancer diagnosis. A bidirectional positive relationship between intrusions and avoidance was predicted. In line with relevant theories (Foa, Steketee, & Rothbaum, 1989; Horowitz, 1986; Janoff-Bulman & Frieze, 1983), it was hypothesized that the relationship will attenuate over the course of the first year following diagnosis, as cognitive and emotional processing of the stress of the cancer experience occurs.

These associations were examined while controlling for variables with well-documented associations with intrusions and avoidance. Research demonstrates that time since the index event (i.e., diagnosis) is an important predictor of frequency of intrusive thoughts (Patterson, Carrigan, Questad, & Robinson, 1990; Sundin & Horowitz, 2002). Similarly, intrusions and avoidance often co-occur with depression (Brewin, Reynolds, & Tata, 1999; Brewin *et al.*, 1998). In fact, avoidance and intrusions are often key features of depressive episodes and may be implicated in their persistence (Williams & Moulds, 2007). Owing to these relationships, the interplay between avoidance and intrusions was examined with time since diagnosis and initial depressive symptoms controlled.

## Method

### *Participants*

Participants ( $N = 460$ ) were women diagnosed with invasive breast cancer who were recruited within 4 months of diagnosis to take part in a larger parent study (Stanton *et al.*, 2015). Women were recruited from four oncology clinics in the United States. This study reports on the three assessments (study entry, 3 months, and 6 months) from the parent study at which the two central measures (i.e., intrusive thoughts, avoidance coping) were both administered. Of the 460 women assessed at study entry, 420 (91%) and 411 (89%) completed the 3- and 6-month assessments, respectively. Demographic and medical characteristics of the sample are contained in Table 1.

### *Procedures*

Institutional ethics review boards of the participating institutions in the United States approved study procedures. Research staff identified potentially eligible women via medical chart review. With verbal consent, study staff contacted interested women to describe the study. Eligibility criteria included new or first recurrence of Stage 1–4 breast cancer, ability to complete the study entry session within 4 months of diagnosis, and English literacy. Participants were excluded from the study if they were under the age of 21, had current suicidality, or had current or past bipolar disorder, schizophrenia, schizoaffective disorder, or cognitive disorder (e.g., dementia). Eligible participants were scheduled for an in-person study entry assessment.

Table 1. Sample characteristics for demographic, medical, psychosocial, and study variables (*N* = 460)

	Study entry <i>M</i> ( <i>SD</i> )/ <i>N</i> (%)	3 Months <i>M</i> ( <i>SD</i> )/ <i>N</i> (%)	6 Months <i>M</i> ( <i>SD</i> )/ <i>N</i> (%)
Sample characteristics			
Age	56.35 (12.61)		
Ethnicity			
Asian	24 (5.20)		
White/European American	311 (67.60)		
Latina	89 (19.30)		
Black/African American	10 (2.20)		
Multiracial	8 (1.74)		
Other	18 (4.00)		
Income			
Less than \$50,000	124 (28.50)		
\$50,000–\$74,999	97 (22.30)		
\$75,000–\$100,000	57 (13.10)		
More than \$100,000	157 (36.10)		
Employment			
Employed	236 (52.10)		
Not Employed	83 (18.30)		
Retired	134 (29.60)		
Education			
High School or Less	114 (23.10)		
2-Year College	91 (20.00)		
4-Year College	164 (36.10)		
Advanced degree	85 (18.80)		
Relationship status			
Significant other	317 (69.70)		
No significant other	138 (30.30)		
Months since diagnosis	2.13 (0.81)	5.21 (1.14)	7.99 (1.01)
Stage			
1	197 (43.80)		
2	176 (39.10)		
3	52 (11.60)		
4	25 (5.60)		
Chemotherapy in the past 6 weeks	167 (41.69)	110 (28.35)	27 (7.01)
Surgery in the past 6 weeks	270 (59.60)	43 (11.08)	48 (12.47)
Taking Estrogen Antagonist	30 (6.62)	53 (13.77)	85 (22.14)
Taking Aromatase Inhibitor	37 (8.17)	71 (18.44)	79 (20.57)
Radiation therapy in the past 6 weeks	31 (7.01)	19 (4.90)	39 (10.13)
Herceptin use in the past 6 weeks	72 (15.89)	80 (20.73)	79 (20.52)
Depressive Symptoms (CES-D)	12.82 (10.64)	11.65 (10.94)	10.10 (10.16)
CES-D ≥ 16	144 (31.79)	114 (29.38)	87 (22.66)
Study variables			
Avoidance	1.58 (0.39)	1.63 (0.39)	1.56 (0.39)
Intrusions	10.22 (8.41)	9.10 (8.10)	6.93 (7.34)

Note. Scores of  $\geq 16$  on the CES-D are suggestive of clinically relevant depressive symptoms (Lewinsohn, Seeley, Roberts, & Allen, 1997).

### *Study entry assessment*

Participants met with research staff in a private room of the oncology centre or the women's home for the study entry session, which lasted approximately 3 hr. After giving informed consent, women completed the self-report measures as well as additional measures not relevant here. Participants completed most measures via interview format or on a computer with assistance from study staff based on participant preference. To reduce participant burden, women were asked to complete additional questionnaires at home and return them by mail, including the Impact of Event Scale analysed in this study. Women were compensated \$60 for taking part in the study entry assessment, which was completed 2 months post-diagnosis on average.

### *Three- and six-month assessments*

Women were contacted by telephone to complete self-report measures over the phone 3 and 6 months after study entry. Telephone assessments lasted approximately 30 min, and women were compensated \$30. Women completed the 3- and 6-month follow-up assessments on average 5 and 8 months post-diagnosis, respectively.

## *Measures*

### *Intrusions*

Mental intrusions about participants' breast cancer were assessed using the 7-item subscale of the Impact of Event Scale-Revised (IES; Horowitz, Wilner, & Alvarez, 1979). Participants rated how frequently 'comments made by women regarding their experience of breast cancer were true for them over the past week' as 0 (*not at all*), 1 (*rarely*), 3 (*sometimes*), or 5 (*often*). A sample item is '*Any reminder brought back feelings about it*'. Items are summed with higher scores indicating greater frequency of cognitive and emotional intrusions. The IES has strong test-retest reliability ( $r_{tt} = .79-.87$ ) as well as convergent validity with measures of post-traumatic stress disorder (Foa, Cashman, Jaycox, & Perry, 1997). Internal consistency in this sample ranged from  $\alpha$  of .87 to .90.

### *Avoidance coping*

The use of avoidance to cope with cancer-related thoughts and feelings was assessed using the mental disengagement, behavioural disengagement, and denial subscales of the COPE Inventory (COPE; Carver, Scheier, & Weintraub, 1989). This 12-item composite measure of avoidance coping has been used in previous studies to form a psychometrically sound measure (e.g., Stanton, Kirk, Cameron, & Danoff-Burg, 2000). Participants rated how much or how often they do each item on a 4-point Likert scale from 1 (*I usually don't do this at all*) to 4 (*I usually do this a lot*). A sample item is '*I act as though it hasn't even happened*'. Items are averaged; total scores range from 1 to 4, with higher scores indicating greater use of avoidance to cope with cancer. To reduce participant burden, the avoidance subscale of the IES was not administered because of its overlap with the COPE avoidance scale. However, these scales are moderately, positively correlated (Stanton, Danoff-Burg, Sworowski, *et al.*, 2002). Avoidance subscales of the COPE have demonstrated construct validity as evidenced by positive correlations with anxiety and negative correlations with optimism and

self-esteem (Carver *et al.*, 1989). Internal consistency in this sample ranged from  $\alpha = .71$  to  $.74$ .

### *Depressive symptoms*

Depressive symptoms at study entry were assessed using the 20-item Center for Epidemiologic Studies-Depression scale (CES-D; Radloff, 1977). A sample item is '*I felt sad*'. Participants rated each item on a 4-point Likert scale from 0 (*rarely or none of the time*) to 3 (*most of the time*). Internal consistency in this sample was  $\alpha = .91$ .

### *Time since diagnosis*

Date of diagnosis was obtained via medical chart review. Time since diagnosis in months was calculated based on the date of diagnosis.

### *Demographic and cancer-related variables*

Women self-reported demographic information and cancer-related information at study entry. Cancer stage was self-reported at study entry and verified by chart review.

### *Data analysis*

Descriptive statistics and correlations between study variables were computed. To determine whether levels of avoidance and intrusions were significantly different at each study assessment, paired samples *t*-tests were conducted.

### *Missing data*

There was minimal missingness on intrusions and avoidance, ranging from 2% to 18% across study time points. *T*-tests and chi-square tests were conducted to determine whether participants who were missing data on avoidance or intrusions differed from those who did not have missing data on study entry variables, including age, time since diagnosis, chemotherapy status, depressive symptoms, avoidance, and intrusions. There were no significant differences for women with and without missing data on avoidance at study entry or the 3-month assessment ( $ps > .05$ ). However, compared to women who did not have missing data, women who were missing on avoidance at the 6-month assessment were more likely to have a higher cancer stage  $t(457) = -2.46$ ,  $p = .01$ .<sup>1</sup> Women with missing data on intrusions at study entry had significantly higher depressive symptoms  $t(457) = -3.37$ ;  $p = .001$  and use of avoidance coping  $t(457) = -2.08$ ;  $p = .04$  at study entry than those without missing data. There were no significant differences between women with and without missing data on intrusions at 3 or 6 months ( $ps > .05$ ). Overall, there was no consistent pattern of differences for individuals who had or did not have missing data on the main study variables and data were presumed to be missing at random. However, to correct for missing data, full information maximum likelihood (FIML; Enders & Bandalos, 2001) was used to

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<sup>1</sup> A model with cancer stage included as a covariate was also examined and results remained the same.

incorporate cases with missing data on predictors. FIML uses observed responses in the data to estimate missing values.

### ***Cross-lagged panel analysis***

Structural equation modelling in Mplus version 7.3 was used to construct cross-lagged panel analyses (Finkel, 1995; Martens & Haase, 2006) to examine the bidirectional relationship of intrusions with avoidance-oriented coping for a 6-month study period in the year following breast cancer diagnosis. Good model fit was indicated using a comparative fit index (CFI) and Tucker–Lewis index of  $>.95$ , and root mean square error of approximation of  $<.06$  (Hu & Bentler, 1999). A series of nested models were compared to examine the hypothesized cross-lagged model demonstrating mutual influence between predictors. All models included the predictors (i.e., intrusions and avoidance) at each time point (study entry, 3 months, 6 months). Time since diagnosis and depressive symptoms at study entry were controlled on study entry intrusions and avoidance in all models.

Estimation of models began with a model containing only autoregressive paths of each independent variable predicting itself at a subsequent time point. From that base model, cross-lagged paths were either added or autoregressive paths were constrained to be equal to examine more complex models and determine the best-fitting model. To find the best-fitting model, five possible models of the relationship between intrusions and avoidance were compared: Model 1 (M1): only the autoregressive paths of intrusions and avoidance; Model 2 (M2): autoregressive paths and the and cross-lagged paths predicting intrusions from avoidance; Model 3 (M3): autoregressive paths and cross-lagged paths predicting avoidance from intrusions; Model 4 (M4): autoregressive paths and all cross-lagged paths; and for parsimony, Model 5 (M5): autoregressive paths and all cross-lagged paths with the autoregressive paths for each predictor constrained to be equal (i.e., coefficients of autoregressive paths from study entry to 3 months fixed to be equal to coefficients from 3 to 6 months). Significant differences in fit between models were evaluated using likelihood ratio tests. A  $p$  value of less than  $.01$  was considered statistically significant to adjust for the multiple comparisons in the models.

All models controlled for time since diagnosis and depressive symptoms at study entry. Variables at study entry and error terms associated with variables were freely covaried within a time point. Within a variable, heterogeneous residual variances were allowed across time but were assumed independent over time. Standardized betas are presented for all models, which can be interpreted as standardized effect sizes (Kelly & Preacher, 2012).

## **Results**

### ***Descriptive statistics***

Bothersome intrusions were significantly more frequent at study entry ( $M = 10.22$ ,  $SD = 8.41$ ) than at the 3-month assessment ( $M = 9.1$ ,  $SD = 8.10$ ),  $t(355) = 2.00$ ,  $p = .05$ , and the 6-month assessment ( $M = 6.93$ ,  $SD = 7.34$ ),  $t(353) = .28$ ,  $p \leq .001$ . There was a trend for lower avoidance at study entry ( $M = 1.58$ ,  $SD = 0.39$ ) than at 3 months ( $M = 1.63$ ,  $SD = 0.39$ ),  $t(381) = 1.87$ ,  $p = .06$ , and avoidance at 3 months was significantly higher than avoidance at 6 months,  $t(338) = 2.87$ ,  $p = .004$ . There was no statistically significant difference in avoidance coping between study entry and 6 months ( $M = 1.56$ ,  $SD = 0.39$ ),  $t(380) = .28$ ,  $p = .78$ . Across assessment points, use of avoidance

Table 2. Correlations between study variables

	1	2	3	4	5	6
1. Avoidance Study Entry	–	.51**	.47**	.25**	.23**	.25**
2. Avoidance 3 months		–	.65**	.33**	.45**	.37**
3. Avoidance 6 months			–	.21**	.31**	.34**
4. Intrusions Study Entry				–	.52**	.48**
5. Intrusions 3 months					–	.66**
6. Intrusions 6 months						–

Note. \*\* $p \leq .01$ .

coping and frequency of intrusions were moderately, positively correlated ( $r$ 's = .23–.45; see Table 2).

### Cross-lagged panel analysis

#### Model comparison

Compared to the model with autoregressive paths only (M1), there was significant improvement in model fit when adding cross-lagged paths from avoidance to intrusions (M2) or adding cross-lagged paths from intrusions to avoidance (M3). Similarly, adding bidirectional cross-lagged paths between predictors significantly improved model fit compared to M2 and M3. Finally, the fit of a fully saturated model with autoregressive paths from study entry to 3 months and paths from 3 months to 6 months constrained to be equal (M5) was not significantly different than a fully saturated model with no constrained coefficients (M4). Therefore, a model with bidirectional cross-lagged paths between the predictors best fits the data and due to the additional parsimony, a model with bidirectional cross-lagged paths and autoregressive paths constrained to be equal best fits the data (M5). See Table 3 for fit indices and model comparisons for all models.

Table 3. Fit indices for cross-lagged models of associations between avoidance coping and intrusions over time and chi-square model comparisons

Model	$\chi^2$ (df)	RMSEA	CFI	TLI	SRMR	$\chi^2$ (df) vs. M1	$p$ Value	$\chi^2$ (df) vs. M4	$p$ Value
Model 1	47.04 (14)	.07	.95	.91	.07	–	–	–	–
Model 2	37.99 (12)	.07	.96	.92	.05	11.39 (2)	<.01	16.99 (2)	<.001
Model 3	32.09 (12)	.06	.97	.94	.05	19.54 (2)	<.001	8.84 (2)	.01
Model 4	25.01 (10)	.06	.98	.94	.03	28.38 (4)	<.001	–	–
Model 5	25.25 (12)	.05	.98	.96	.04	26.43 (2)	<.001	1.95 (2)	.38

Note. Model 1 (M1) = autoregressive paths only; Model 2 = M1+ cross-lagged paths from avoidance to intrusions; Model 3 = M1+ cross-lagged paths from intrusions to avoidance; Model 4 (M4) = M1+ bidirectional cross-lagged paths from avoidance to intrusions and from intrusions to avoidance; M5 = M4 with autoregressive paths for each predictor constrained to be equal; CFI = comparative fit index; TLI = Tucker–Lewis index; SRMR = standardized root mean square residual; RMSEA = root mean standard error of approximation. All models controlled for time since diagnosis and depressive symptoms at study entry. Bold indicates the most parsimonious, best-fitting model.

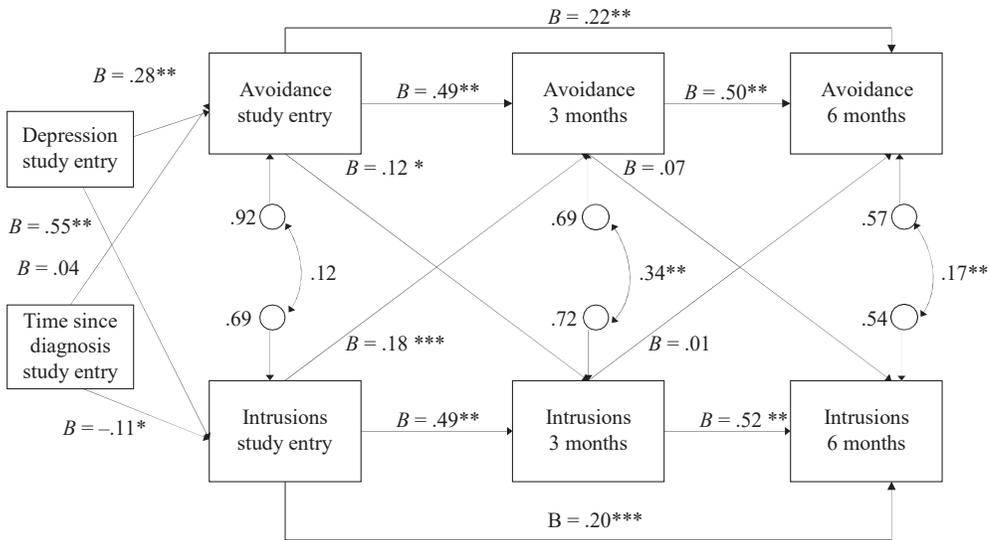


Figure 1. Model containing all cross-lagged paths as well as autoregressive paths that were constrained to be equal. Note. \* $p < .01$ ; \*\* $p \leq .001$ . Standardized betas presented.

### Best-fitting model

In the best-fitting model (M5; see Figure 1), time since diagnosis was significantly negatively related to intrusions at study entry ( $b = -.11$ ,  $p = .01$ ), but was not significantly related to avoidance ( $b = .04$ ,  $p = .34$ ). Depressive symptoms at study entry was significantly positively related to avoidance ( $b = .28$ ,  $p < .001$ ) and intrusions ( $b = .55$ ,  $p < .001$ ) at study entry. Greater use of avoidance coping at study entry was significantly related to greater avoidance at 3 months ( $b = .49$ ,  $p < .001$ ) and 6 months ( $b = .22$ ,  $p < .001$ ), and greater avoidance at 3 months significantly predicted greater avoidance at 6 months ( $b = .50$ ,  $p < .001$ ). Similarly, greater intrusions at study entry significantly predicted greater intrusions at 3 months ( $b = .49$ ,  $p < .001$ ) and 6 months ( $b = .20$ ,  $p < .001$ ), and greater intrusions at 3 months significantly predicted greater intrusions at 6 months ( $b = .52$ ,  $p < .001$ ). Cross-lagged paths indicate that greater use of avoidance coping at study entry significantly predicted greater intrusions at 3 months over and above study entry levels of intrusions ( $b = .12$ ,  $p < .01$ ); however, avoidance coping at 3 months did not significantly predict intrusions at 6 months over and above 3-month levels of avoidance ( $b = .07$ ,  $p = .18$ ). Following the same pattern, greater frequency of bothersome intrusions at study entry predicted greater use of avoidance coping at 3 months ( $b = .18$ ,  $p < .001$ ); however, intrusions at 3 months did not significantly predict avoidance at 6 months ( $b = .01$ ,  $p = .79$ ).

### Strength of cross-lagged paths over time

To test whether the magnitude of the cross-lagged paths from study entry to 3 months differed significantly from the cross-lagged paths from 3 to 6 months, likelihood ratio tests were used. Model fit for a model in which cross-lagged paths were freely estimated was compared to the fit of a model in which the cross-lagged paths at each time point were

constrained to be equal. When the cross-lagged paths from intrusions at study entry to avoidance at 3 months were constrained to be equal to the cross-lag from intrusions at 3 months to avoidance at 6 months, model fit decreased significantly, suggesting that the magnitude of cross-lagged path from study entry to 3 months is significantly greater than the cross-lagged path from 3 to 6 months,  $\chi^2(1, N = 460) = 7.63, p = .01$ . When the cross-lagged paths from avoidance at study entry to intrusions at 3 months were constrained to be equal to the cross-lag from avoidance at 3 months to intrusions at 6 months, there was no significant difference in model fit, suggesting the magnitude of the cross-lag from avoidance and intrusions at the two time points did not differ significantly,  $\chi^2(1, N = 460) = 1.00, p = .32$ .

### Post-hoc analyses

Based on reviewers' suggestions, supplemental analyses examined self-reported mental health treatment as a moderator. Multigroup analyses were performed to determine whether the strength of the reciprocal relationships between avoidance and intrusions differed for individuals who self-reported receiving mental health treatment compared to those who did not. At the 3- and 6-month follow-up assessments, participants responded 'yes' or 'no' to whether or not they had received mental health treatment of any kind (e.g., individual counselling, support group, psychopharmacologic) since their diagnosis. Women who endorsed receiving mental health treatment at any study assessment were coded as having received treatment ( $n = 128$ ), those who denied receiving mental health treatment at all time points were coded as having received no treatment ( $n = 324$ ). First, the best-fitting model (M5) was fit in each group (mental health treatment vs. no treatment) in which all paths were free to take on values that best fit the data. Next, a second model constraining all four cross-lagged paths to be equal across groups was fit. Likelihood ratio tests between models indicated that the strength of the cross-lagged paths were not significantly different in two groups,  $\chi^2(4, n = 452) = 2.56, p = .63$ . In additional analyses, models with each of the individual cross-lagged paths constrained to be equal across groups were fit and compared to the model with no constraints. Likelihood ratio tests revealed that none of the cross-lagged paths differed in strength across the two groups (all  $p$ s  $> .20$ ). All cross-lagged paths in both groups followed the same pattern of results as the model in the full sample.

## Discussion

Theories of cognitive and emotional processing of stressful and traumatic events purport that individuals experience cycles of intrusions and avoidance until the event is integrated into a person's previously held schemas. However, empirical evidence demonstrating the reciprocal relationship between intrusions and avoidance over time is lacking. The present findings support a bidirectional, positive relationship between avoidance coping and intrusions from study entry to the 3-month follow-up, with no significant bidirectional relationship between avoidance and intrusions from 3 to 6 months.

Women reported consistent levels of avoidance-oriented coping from study entry to the 6-month follow-up, with reports ranging from not using avoidance at all to using avoidance a little bit. Rates of avoidance in this sample were comparable to rates in other

samples of women with breast cancer (Carver *et al.*, 1993; Stanton, Danoff-Burg, & Huggins, 2002; Stanton, Danoff-Burg, Sworowski, *et al.*, 2002), individuals with other chronic illness (Burker, Evon, Losielle, Finkel, & Mill, 2005; Karlsen & Bru, 2002), and emergency responders (Nydegger, Nydegger, & Basile, 2011). The extent of avoidance did not differ significantly from study entry to 6-month follow-up, but there was a trend for increased avoidance at 3 months and a significant decrease from three to 6 months. Following threat, avoidance behaviours can persist even once the stressor has lessened (Treanor & Barry, 2017), which could contribute to relatively stable rates of avoidance in this sample. Women also reported experiencing intrusions at comparable rates to those reported in other studies of women with breast cancer (Epping-Jordan *et al.*, 1999; Moreno *et al.*, 2016; Primo *et al.*, 2000), individuals with other chronic illnesses (Antoni *et al.*, 1991; Violanti *et al.*, 2006), and individuals following natural disasters (Ironson *et al.*, 1997). Frequency of intrusions significantly decreased from study entry through the 6-month follow-up.

Past research has examined avoidance as a predictor of intrusions (Lawrence *et al.*, 1996; Moreno *et al.*, 2016), or intrusions as a predictor of avoidance (Manne *et al.*, 2001; McFarlane, 1992), but generally has not tested their reciprocal relationship. In the present study, a model containing bidirectional cross-lagged paths between intrusions and avoidance fit the data significantly better than models containing autoregressive paths only, cross-lagged paths from intrusions to avoidance, and cross-lagged paths from avoidance to intrusions. Specifically, greater use of avoidance to cope with cancer at study entry predicted greater cancer-related intrusions 3 months later. Similarly, greater frequency of cancer-related intrusions predicted greater use of avoidance to cope with cancer 3 months later. These relationships were statistically significant after controlling for the stability of intrusions and avoidance over the 6-month course of the assessments, time since diagnosis at study entry, and depressive symptoms at study entry. On average, at study entry, women in this study were 2 months from diagnosis and were below the threshold indicative of clinically significant depressive symptoms on the CES-D, with approximately 33.0% of the sample above the CES-D cut-off indicative of depression (Stanton *et al.*, 2015). These results are consistent with the positive unidirectional relationships between intrusions and avoidance found in previous research (Brewin *et al.*, 1998; Cordova *et al.*, 1995; Epping-Jordan *et al.*, 1994; Horowitz, 1986; Wegner *et al.*, 1987).

The significant bidirectional relationships did not hold from the 3-month assessment to the 6-month assessment when accounting for study entry and 3-month levels of intrusions and avoidance, which is consistent with the hypothesis that the relationships would attenuate over time. Analyses examining the strength of the cross-lagged paths over time revealed that the magnitude of the predictive relationship from intrusions to avoidance from study entry to the 3-month assessment was significantly greater than the predictive relationship from intrusions at the 3-month assessment to the 6-month assessment. However, the significant relationship between avoidance predicting intrusions from study entry to the 3-month assessment did not significantly differ in magnitude from the non-significant relationship between avoidance and intrusions at the 3-month assessment to the 6-month assessment. It is possible that avoidance would continue to predict intrusions to a similar degree over time; however, in the present study, not only did the frequency of intrusions decrease over time but also there is less residual variance in intrusions at the 6-month assessment after controlling for intrusions at study entry and 3 months.

Taken together, findings are in accordance with theories of cognitive and emotional processing of stressful events, which posit that individuals experience phases of avoidance and intrusions as they work to process the event (Horowitz, 1986; Janoff-Bulman, 1989). The positive prediction of increased use of avoidance from study entry levels of intrusions is in line with Horowitz's (1982) hypothesis as well as empirical tests of this relationship (Manne *et al.*, 2001; McFarlane, 1992). However, results from the present study are counter to the hypothesis that avoidance dampens intrusions following from the Horowitz model. In fact, initial use of avoidance predicted increases in later intrusions, which supports Wegner's experimental findings (1987; 1990) and the results of observational studies (Lawrence *et al.*, 1996; Moreno *et al.*, 2016). The present findings extend previous research by revealing a contemporaneous bidirectional relationship between intrusions and avoidance.

Results suggest that the reciprocal influence of intrusions and avoidance persists through the 3-month follow-up, which corresponds to an average of 5 months after diagnosis. However, the diminishing relationship between intrusions and avoidance from the 3- to 6-month assessments in this study (i.e., from an average of 5 to 8 months after diagnosis) suggests that the predictive relationship between intrusions and avoidance attenuates over time. Theories of cognitive and emotional processing would suggest that the presence of intrusions and avoidance is indicative of incomplete processing of stressful events. Therefore, it is possible that the more distal the diagnosis, the more likely it is that women successfully process and integrate their diagnosis into their pre-existing mental schemas. Consistent with this pattern, rates of clinically suggestive depressive symptoms declined from 32% at study entry to 23% by the 6-month follow-up indicating distress began to resolve over time in this sample (see Stanton *et al.*, 2015 for detailed information on the trajectories of depressive symptoms in this sample). A similar pattern emerged for bothersome physical symptoms in this sample, with sharp declines from 6 to 10 months after diagnosis (Bauer *et al.*, 2016).

Although declining intrusions as well as the reciprocal influence of intrusions suggest possible successful cognitive and emotional processing by an average of 8 months after diagnosis in this sample, similar to previous studies, women in this sample still reported some intrusions about their cancer at the 6-month follow-up, on average (Andrykowski, Cordova, McGrath, Sloan & Kenady, 2000; Matsuoka *et al.*, 2002). Given that persistent intrusions in survivorship are a risk factor for poor psychological and physical problems (Devine *et al.*, 2003; Dupont *et al.*, 2014; Smith, Redd, Peyserm & Vogl, 1999), women seeking psychosocial support after diagnosis may benefit from psychological approaches aimed at addressing intrusions and avoidance with the goal of facilitating processing of the experience.

Although exploratory *post-hoc* analyses in the current study revealed no difference in the magnitude of the cross-lagged paths for women who self-reported at least some mental health treatment after enrolling in the study, specifics about treatment (e.g., duration, therapeutic orientation) were not reported, limiting conclusions that can be drawn. Further research investigating the effect of treatment on avoidance and intrusions is necessary. To interrupt the cyclical relationship between avoidance and intrusions, interventions could aim to replace the need for coping with intrusions through avoidance coping strategies. Reducing avoidance and replacing it with more effective cognitive and emotional processing strategies may be particularly helpful soon after diagnosis. Studies suggest that acceptance-based interventions improve the quality of life of individuals with cancer (Arch & Mitchell, 2016; Bower *et al.*, 2015; Feros, Lane, Ciarrochi, & Blackledge,

2013), as do approaches targeting stressor-related emotional expression and reappraisal (e.g., Antoni *et al.*, 2009; Stanton, Danoff-Burg, Sworowski, *et al.*, 2002). Future studies could investigate the effectiveness of similar interventions for resolution of unwanted intrusions and avoidance for women coping with a recent breast cancer diagnosis. In addition, transdiagnostic therapies (e.g., Barlow, Allen, & Choate, 2004) that reduce avoidance and promote more adaptive approach-oriented coping strategies might be effective in the cancer context.

Findings from this study should be considered in the light of its limitations. The study relied on self-report; such reports of internal processes have been demonstrated to have neural correlates, however (e.g., Amodio, Master, Yee, & Taylor, 2008). Additionally, the use of measures of avoidance and intrusions that do not have clinical interpretation guidelines limits the ability to comment on the clinical significance of the rates of avoidance and intrusions observed in this sample. However, rates are comparable to other studies demonstrating the links of avoidance and intrusions to negative psychological and physical outcomes. Additionally, although this investigation examined the bidirectional relationship of intrusions and avoidance as a part of normative cognitive processing following a stressful life experience, future studies could examine the reciprocal relationship between avoidance and intrusions for people with clinically significant levels of intrusions and avoidance or post-traumatic stress symptomatology. Generalizability of these results to samples enduring other chronic and traumatic stressors should be made with caution. Although the longitudinal design is a strength of this study, future studies should examine the bidirectional relationships between intrusions and avoidance over shorter periods of time (e.g., daily diary study). For example, it is possible that as Horowitz (1986) hypothesizes, avoidance may negatively predict intrusions over shorter time spans. Additionally, such studies that include more than three observations of avoidance and intrusions can examine whether within-person covariation of avoidance and intrusions predicts markers of distress (e.g., depressive symptoms, anxiety, less cognitive processing). Further, future studies should consider potential mechanisms of the reciprocal relationship between intrusions and avoidance. In addition to the longitudinal design, strengths of this study include the large sample, use of missing data modelling, and the cross-lagged panel design.

In that findings support a bidirectional, positive relationship between avoidance coping and intrusions over the first few months following a life-threatening diagnosis of cancer, a recommendation is that future investigations take the reciprocal influence of avoidance and intrusions into account, rather than solely investigating avoidance as a predictor of intrusions, or vice versa. Intrusions shortly after major stressful events are common, and present findings suggest some women continue to experience intrusions through at least an average 8 months after breast cancer diagnosis. Accordingly, acceptance-based and other interventions targeted at reducing emotional suppression and avoidance strategies while promoting mindful awareness and other effective strategies for approaching the experience could improve the well-being of this population in the months following diagnosis.

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## Conflict of interest

All authors declare no conflict of interest.

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