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Implicit Loneliness, Emotion Regulation, and Depressive Symptoms in Breast Cancer Survivors

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Abstract

Among individuals coping with cancer, emotional approach coping—expressing and processing emotions following negative events— has been identified as a potentially adaptive form of emotion regulation. However, its mental health benefits may depend on social-cognitive factors and on how it is implemented. This study examined loneliness as a determinant of emotion regulation associations with depressive symptoms in women with breast cancer. Loneliness was examined as an implicit social-cognitive phenomenon (i.e., automatic views of oneself as lonely), and emotional expression and processing were examined as both explicit and implicit processes. Approximately 11 months after diagnosis, 390 women completed explicit measures of coping through cancer-related emotional expression and processing; an implicit measure of expression and processing (an essay-writing task submitted to linguistic analysis); and an implicit association test (IAT) measuring loneliness. Depressive symptoms were assessed three months later. Regardless of implicit loneliness, self-reported emotional expression (but not emotional processing) predicted *fewer* depressive symptoms, whereas *implicit* expression of negative emotion during essay-writing predicted *more* symptoms. Only among women high in implicit loneliness, less positive emotional expression and more causal processing during the writing task predicted more depressive symptoms. Results suggest that explicit and implicit breast cancer-related emotion regulation have distinct relations with depressive symptoms, and implicit loneliness moderates effects of implicit emotional approach. Findings support implicit processes as influential mechanisms of emotion regulation and suggest targets for intervention among breast cancer survivors.

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Keywords

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Approximately 3.1 million women are living with a history of breast cancer in the United States. More than 200,000 women are diagnosed annually, making breast cancer by far the most common cancer among women (American Cancer Society, 2013). Negative emotions are normative responses to cancer diagnosis and treatment. Rates of major depressive disorder—a more problematic affective response—are most elevated in the period following cancer diagnosis (an estimated 16.3%; Mitchell et al., 2011), and patients with co-occurring depression suffer more physical symptoms, problems with treatment adherence, and higher mortality, in addition to the impairment of depressive symptoms themselves (Cuijpers et al., 2014; DiMatteo et al., 2000; Stanton et al., 2015). Depression is also linked with functional limitations during survivorship (Steiner et al., 2008), and decreases in depressive symptoms over time have been associated with greater longevity in women with metastatic breast cancer (Giese-Davis et al., 2011). Therefore, prevention and intervention efforts aimed at physical and mental health may benefit from increased understanding of processes that drive depressive symptoms among women coping with breast cancer. Accordingly, the primary goal of the present study was to examine the interacting roles of emotion regulation and loneliness—two important contributors to depression—within the context of coping with breast cancer.[1]

Emotion Regulation, Depression, and Coping with Cancer

Research in mood psychopathology indicates that maladaptive patterns of emotion regulation are important determinants of depression and physical health in coping with stressors, including cancer (Aldao et al., 2010; Taylor & Stanton, 2007). Emotion regulation refers to the strategies and processes by which individuals modify their emotional reactions in response to stressors and negative affective states (Gross, 1998). Regulating emotional distress through active strategies (e.g., problem solving, cognitive reappraisal), rather than through avoidant strategies (e.g., disengagement, expressive suppression), is a hallmark of more adaptive regulation, and is associated with lower depression (Aldao et al., 2010).

More specifically, regulating negative affect by “approaching” emotions can contribute to more adaptive outcomes with respect to psychological distress, depression, and physical health than do suppression or avoidance (Taylor & Stanton, 2007). Emotional approach coping refers to a specific, active form of responding to negative situations by attending to, processing, and expressing emotions (e.g., Stanton, Kirk et al., 2000). Emotional approach coping can be considered emotion regulation in that it involves actively *expressing* and/or *processing* negative emotional experience in an effort to decrease it. Among women with breast cancer, emotional approach coping predicts a decline in psychological distress, improvement in self-perceived health, and fewer medical appointments for cancer-related morbidities (Stanton, Danoff-Burg et al., 2000; Stanton et al., 2002). However, not all forms

[1]For the present purposes, we use the term “cancer survivor” as defined by both the American Cancer Society and the National Cancer Institute, which includes anyone diagnosed with cancer through the end of life, regardless of treatment or remission.

of focus on one's emotions are adaptive for depression. For example, attempts to regulate negative emotions that take the form of repetitive, passive processing (i.e., rumination) rather than more active processing give rise to maladaptive outcomes, including depression and anxiety (e.g., Nolen-Hoeksema et al., 2008).

Therefore, a key question is what determines whether emotional expression and processing are linked with positive versus negative mental health outcomes. Notably, effects of these emotional approach components depend in part on intrapersonal factors (e.g., gender; Juth, Dickerson, Zoccola, & Lam, 2015) and environmental contexts (e.g., social contexts receptive to emotional expression and processing; Stanton, Danoff-Burg et al., 2000), indicating that emotion regulation in coping with cancer does not occur in a vacuum. The notion that social factors may play a determining role is consistent with findings that individuals' emotion regulation strategy use has different links with depressive symptoms depending on social connectedness versus loneliness (Marroquín & Nolen-Hoeksema, 2015). Understanding socially-relevant factors that moderate effects of emotional expression and processing among women with breast cancer may have important implications for treatment, as it may help identify women at higher risk for maladaptive coping outcomes, or suggest social targets in individually-focused treatment.

Loneliness as a Context of Emotion Regulation

Especially important in this regard is the powerful role of loneliness as women cope with cancer. Research on emotional approach has focused primarily on direct effects at the intrapersonal level (i.e., how the individual's regulatory efforts affect outcomes). However, patients' social relationships and support resources—and especially how patients perceive them—also affect outcomes in breast cancer (Kroenke et al., 2013; Stanton, Danoff-Burg et al., 2000; Weihs et al., 2008). One of these factors is loneliness, or an individual's distressing or unsatisfying perception of a lack of available relationships to meet his or her social needs. Loneliness is implicated in a range of physical and mental health outcomes, including cancer, cardiovascular disease, and all-cause mortality (Hawkley & Cacioppo, 2010), and is associated with immune dysregulation, depression, fatigue, and pain in breast cancer survivors (Jaremka et al., 2013).

Loneliness also plays a prominent role in depression in the general population (Cacioppo et al., 2010), and part of this role may be that it affects emotional and emotion-regulatory processes. Loneliness has cognitive and affective correlates (e.g., negative attentional bias; executive dysfunction; Cacioppo & Hawkley, 2009) which are implicated in depression, suggesting that loneliness affects the regulatory processes involved in the psychopathology of depression (Marroquín, 2011). Not only do lonelier individuals use more maladaptive and fewer adaptive emotion regulation strategies than individuals who perceive themselves as socially connected, their maladaptive strategies are also more strongly linked with depression (Marroquín & Nolen-Hoeksema, 2015), suggesting that lower perceptions of available social relationships determine effects of regulatory efforts.

The primary purpose of the present investigation was to examine loneliness as a social-cognitive moderator of intrapersonal emotion regulation (specifically, emotional expression

and processing) among women coping with breast cancer. That is, we sought to understand whether individuals' emotional approach coping with their cancer experience would be associated with depressive symptoms differently depending on loneliness. We hypothesized that emotional expression and processing would be more strongly linked with symptoms when women were higher in loneliness, as are other emotion regulation strategies (Marroquín & Nolen-Hoeksema, 2015). As such, we sought to apply recent findings in the general population to address open questions of how social and emotional factors interact in cancer survivorship specifically. In addition, we aimed to extend this understanding beyond explicit measures of loneliness and emotion regulation, and toward implicit processes that are not well-captured in existing literature.

The Role of Implicit Processes

Research on emotion, emotion regulation, and loneliness in physical health and depression has emphasized explicit processes, that is, intentional, conscious, and/or self-reported influences. However, some key processes may be inaccessible to the individual or imperfectly suited to explicit measurement. Implicit processes are those which cannot be directly accessed by introspection because people are unable or unwilling (see Nosek et al., 2007, for a review). Implicit measurement can be especially informative in addressing questions about which individuals are incapable of accurate reporting, biased by social desirability or self-presentation, or motivated to view themselves in a certain light. Emotion and emotion regulation occur at both implicit and explicit levels (Koole & Rothermund, 2011), and individuals differ in their capacity or willingness to notice, reflect on, and verbalize affective experiences in ways relevant to depression (Vine & Aldao, 2014). Being able and willing to report on one's social isolation and emotion regulation may present special challenges with regard to depression, which is associated with a host of biases in attention, memory, and processing that are also implicated in emotion dysregulation (Gotlib & Joormann, 2010).

If social connectedness or loneliness affect intrapersonal emotion regulation processes outside the immediate context of social interaction, then effects likely depend on internal representations in cognition, i.e., implicit associations among social and affective information. Accordingly, a novel aim of our study involved examining emotion regulation and loneliness as implicit processes. Paralleling explicit measures of emotional expression and processing, we measured implicit counterparts of the same constructs by examining linguistic properties of women's writing during a task in which they focused on their cancer experience. Moreover, we measured loneliness not as explicitly-perceived social connectedness, but as an implicit social-cognitive construct, examining women's cognitive representations to capture their underlying views of themselves as lonely or not.

The Present Study

The overarching aim of the present study was to examine links among implicit processes of loneliness and emotion regulation in depressive symptoms among women diagnosed with breast cancer. Figure 1 depicts an overall model of the hypothesized relations among implicit loneliness, emotional expression and processing (implicit and explicit), and depressive

symptoms. We tested the following hypotheses: (1) Cancer-related emotional expression and processing, each measured as both explicit and implicit processes, would predict lower depression three months later (i.e., main effects); and (2) Consistent with findings that loneliness amplifies associations of emotion regulation with depression, women would show stronger effects of expression and processing on symptoms if they held stronger implicit representations of themselves as lonely (i.e., implicit loneliness as a moderator of main effects). We tested these hypotheses in a sample of women beyond the phase immediately after diagnosis because, after an initial increase, social support declines after the early diagnosis and treatment phase (Thompson et al., 2013), and thus loneliness may be particularly relevant to emotion regulation and depression during this period.

Method

Participants and Procedure

Study participants were 390 of 460 women recently diagnosed with breast cancer, participating in a study of predictors of depression and other outcomes over the course of the year following diagnosis. Women were recruited from three oncology clinics in the greater Los Angeles area ($n = 297$), referred to here as the University of California, Los Angeles (UCLA) site, and one clinic at the University of Arizona Cancer Center ($n = 163$). They entered the study an average of 2.28 months ($SD = 0.90$) after receiving a breast cancer diagnosis. Inclusion criteria were a new or first recurrent diagnosis of invasive breast cancer, scheduled for the study entry visit within four months of cancer diagnosis, and ability to complete assessments in English. Participants undergoing any standard medical treatment for cancer (i.e., surgery, chemotherapy, radiotherapy, neoadjuvant chemotherapy, endocrine therapy) and taking any additional medication were eligible. Exclusion criteria included diagnoses of bipolar disorder, schizophrenia, or schizoaffective disorder; current suicidality; younger than 21 years; no English literacy; or a cognitive disorder (e.g., dementia).

Eligible participants completed an in-person study-entry assessment within four months of diagnosis and follow-up telephone assessments 6, 12, 18, and 24 weeks after initial assessment; an in-person assessment at 9 months; and a telephone assessment at 12 months. Of the 460 recruited women, 390 women who participated in the 9- and/or 12-month follow-up assessment (i.e., approximately 11 and 14 months after diagnosis) comprised the observed sample for this study (Arizona $n = 155$; UCLA $n = 235$). Sample characteristics, including demographic composition and cancer-related characteristics, are presented in Table 1. By the 9-month assessment, most women had completed any surgery, radiation, and/or chemotherapy treatment, and most women were receiving endocrine therapy. Overall dropout rate between study entry and 9 months was 15%.[2] Missing data adjustments using

[2]Dropout was significantly more frequent at UCLA (62 women; 21%) than at the University of Arizona (8 women; 5%); the 9-month sample thus included proportionally more women at the University of Arizona (40%) versus UCLA (60%) compared to study entry (Arizona 35%, UCLA 65%), $\chi^2(1) = 20.80$, $p < .001$. Dropouts were significantly younger, $M = 52.5$ years, $SD = 13.9$, than women retained at 9 months (see Table 1), $t(450) = -2.75$, $p = .006$, $d = -0.36$. Cancer stage among dropouts was (stages 1, 2, 3, and 4 respectively) 29 (42%), 23 (33%), 8 (12%), and 9 (13%), and differed significantly from retained participants, $\chi^2(3) = 9.34$, $p = .025$, with proportionally fewer stage 2 and 4 subjects in the 9-month sample. Dropout and retained participants did not differ significantly in ethnicity, $\chi^2(7) = 5.84$, $p = .56$, relationship status, $\chi^2(5) = 6.24$, $p = .28$, education, $\chi^2(5) = 3.69$, $p = .60$, income, $\chi^2(3) = 3.90$, $p = .27$, or depressive symptoms at study entry, $t(451) = 1.85$, $p = .07$.

full information maximum likelihood methods (detailed below) used the full study entry sample to estimate less-biased parameters.

The session at 9 months was conducted by trained post-baccalaureate-level research staff in a private room at the oncology center or at women's homes. Women completed self-report measures, including measures of emotion regulation and depressive symptoms, in interview format or on a laptop, facilitated by research staff. They then completed an implicit association test (IAT) designed to measure nonconscious cognitive representations of oneself as lonely (Nausheen et al., 2007). Finally, on paper, they completed an expressive writing task regarding their experience with breast cancer (Stanton et al., 2002), as a behavioral measure of implicit emotional expression and processing. Three months later (i.e., 12 months after study entry), participants completed a follow-up assessment by telephone, including assessment of depressive symptoms. All study procedures were approved by the UCLA and University of Arizona institutional review boards.

Measures

Explicit Emotion Regulation—Emotional expression and processing were measured at 9 months with the Emotional Approach Coping scales (Stanton, Kirk et al., 2000). Participants rated the extent to which they had used strategies in coping with cancer over the past 4 weeks from 1 (*I usually don't do this at all*) to 4 (*I usually do this a lot*). The four-item emotional expression (e.g., "*I take time to express my emotions*") and emotional processing (e.g., "*I take time to figure out what I'm really feeling*") scales average across their constituent items, and have shown good reliability and validity in nonclinical samples (Stanton, Kirk, et al., 2000) and breast cancer-diagnosed samples (Stanton, Danoff-Burg, et al., 2000). Internal consistency in the present sample was good (expression $\alpha = .92$; processing $\alpha = .78$).

Implicit Emotion Regulation—Implicit measurement of emotion regulation (emotional expression and processing) at 9 months was based on participants' performance on the expressive writing task (Pennebaker & Beall, 1986). Participants were asked to write freely for 15 minutes about their "deepest thoughts and feelings about your experience with breast cancer" (see Stanton et al., 2002). Essays were subsequently transcribed by research staff and submitted for linguistic analysis through the Linguistic Inquiry and Word Count (LIWC) computer program (Pennebaker et al., 2007). The LIWC program computes the percentage of words that fall into specific content categories, as referenced against a dictionary of English words. LIWC analysis can be considered an implicit measure of psychological processes, as it assesses constructs that individuals do not consciously monitor during verbal communication, or are unaware of altogether (e.g., Tausczik & Pennebaker, 2010).

In the present study, LIWC content categories were chosen to reflect constructs of emotional expression and processing. To capture implicit processes of emotional expression, the categories of *positive emotion* (e.g., "happy," "nice") and *negative emotion* (e.g., "ugly," "hurt") were used. To capture emotional processing, the categories of *causation* (e.g., "because," "effect") and *insight* (e.g., "think," "consider") were used. These categories have been used in analyses of expressive writing samples, including women with breast cancer

(e.g., Creswell et al., 2007; Low et al., 2006). Internal consistency reliability for these categories ranges from α = .88 to .97 (Pennebaker et al., 2007).

Implicit Loneliness—Implicit loneliness at 9 months was measured by the computer-based Implicit Association Test for Loneliness (IAT-L; Nausheen et al., 2007). The IAT-L uses a reaction time methodology to measure strengths of association among individuals' cognitive representations of target concepts (SELF and OTHERS) and attributes (LONELY and NONLONELY). The task consisted of seven blocks, including three practice blocks. In the first practice block (20 trials), participants were presented with target concept categories only, one on the left (SELF) and one on the right (OTHERS). Exemplars of each these concept categories (e.g., "My," "Them") were then presented one at a time in random order in the center of the screen. Using keyboard keys on the left (*e*) or right (*i*), participants' task was to sort the exemplar into the corresponding category as accurately and quickly as possible. In the second practice block (20 trials), concept categories were replaced with attribute categories (i.e., LONELY on the left; NONLONELY on the right), and presented exemplars were from these attribute categories (e.g., "Deserted," "Cared for").

In the critical third and fourth blocks (60 trials total), concept and attribute categories were paired simultaneously on the screen, sharing response keys (i.e., SELF and LONELY both appeared on the left; OTHERS and NONLONELY both on the right). Exemplars from all four concept and attribute categories were presented in the center of the screen in random order. In the fifth block (a practice block of 20 trials), attribute categories (only) were presented in the opposite configuration as in Block 2 (i.e., NONLONELY on the left; LONELY on the right). In the critical sixth and seventh blocks (60 trials total), concept and attribute categories were again combined, this time in the opposite pairing as in blocks 3 and 4 (i.e., SELF and NONLONELY on the left and OTHERS and LONELY on the right).

For each trial, latency to correct response was measured in milliseconds. Incorrect responses resulted in an "X" displayed on screen, and participants were required to make the correct categorization before proceeding to the next screen. Inter-trial interval was 150 ms. Scoring followed recommended IAT procedures (Greenwald et al., 2003): only data from critical Blocks 3, 4, 6, and 7 were used for analysis; trials with response latencies > 10,000 ms were deleted; and participants with latencies > 300 ms on > 10% of trials were deleted. The IAT *D* (difference) score was derived by subtracting mean response latencies in Block 3 and 4 from Blocks 6 and 7 respectively, dividing these differences by their pooled within-block standard deviations, and then averaging the resulting quantities.

The *D* score (analogous but not identical to Cohen's *d*) thus represents the discrepancy in response latencies between trials in which SELF and LONELY do not share a response key (a more challenging processing task for someone *higher* in implicit loneliness because the concept and the attribute are tied to competing responses) and trials in which SELF and LONELY do share a response key (a less cognitively challenging task if "self" and "lonely" are more closely associated in storage). Thus, higher *D* scores represent higher implicit loneliness, i.e., stronger associations between one's representations of self and loneliness than between self and nonloneliness. For additional information on development of the IAT-L, including exemplars, see Nausheen et al. (2007). General psychometric properties of IAT

methodology across applications are reviewed by Nosek et al. (2007). The IAT-L has shown good internal consistency and predictive validity, having been associated with greater cardiovascular reactivity to stress in a nonclinical sample (Nausheen et al., 2007) and with higher angiogenic cytokine activity in colorectal cancer patients (Nausheen et al., 2010).

Depressive symptoms—Symptoms of depression were measured with the 20-item Center for Epidemiologic Studies Depression scale (CES-D; Radloff, 1977). Participants rated how often they had experienced depressive symptoms (e.g., *I felt like everything I did was an effort*) over the past week, from 0 (*rarely or none of the time*) to 3 (*most or almost all of the time*). Possible scores range from 0 to 60. The CES-D is a widely-used dimensional measure of depression, with good psychometric properties in community and breast cancer-diagnosed populations (Hann et al., 1999). In the present sample, internal consistency was excellent ($\alpha = .92$).

Results

Analytic Approach

We first examined descriptive statistics and zero-order correlations among 9-month predictor variables and 12-month depressive symptoms. To test the hypothesis that relations of emotion regulation with depressive symptoms are moderated by implicit loneliness, we conducted a series of linear regression analyses, one for each emotion regulation variable, which included the IAT-L score, the IAT-L × emotion regulation interaction, and covariates. Covariates included relationship status (participants in a relationship endorsed fewer depressive symptoms than those not in a relationship) and cancer stage at study entry (more advanced stage was associated with more symptoms). Due to associations with depressive symptoms in past research or the present sample, age and treatment regimen during the prior three months (i.e., radiation, chemotherapy, and endocrine treatment) were also covaried.

Regression models were estimated in a path analysis framework using MPlus version 7.3 (Los Angeles, CA: Muthén & Muthén) with full information maximum likelihood (FIML) to address missing data (approximately 15% at 9 months and 20% at 12 months). FIML uses individuals' observed data on other variables to estimate an individual likelihood function for each pattern of missingness, allowing all available data to be used for each individual. FIML yields less biased estimates and superior efficiency over listwise deletion when the data are missing completely at random or missing at random (Enders & Bandalos, 2001). Importantly, even if systematic differences on observed variables exist between participants missing and not missing data, as long as those variables are included in the model, FIML will yield unbiased estimates. Because demographic covariates were measured at study entry only, including covariates and observed variables in FIML models to estimate effects at 9 and 12 months both maximizes effective sample size and reduces estimate bias.

Descriptive Statistics and Zero-Order Correlations

Descriptive statistics and correlations among variables are presented in Table 2, with means and standard deviations along the diagonal. On average, implicit loneliness levels were slightly below 0, suggesting overall stronger implicit associations between oneself and the

"nonlonely" concept than between oneself and "lonely," but women varied substantially in implicit loneliness, ranging from −1.31 to 1.27. Means of LIWC variables in Table 2 represent percentages of participants' essays that matched those language categories; essays included an average of 2.45% negative emotion, 4.57% positive emotion, 1.64% causation, and 3.47% insight words.

Consistent with hypothesis and past research, explicit, self-reported emotional expression in coping with cancer at 9 months was negatively associated with depressive symptoms 3 months later. However, implicit negative emotional expression during the writing task was significantly associated with higher depressive symptoms, whereas implicit positive emotional expression was not associated with symptoms. Contrary to hypothesis, neither emotional processing (both explicit and implicit) nor implicit loneliness was directly associated with depressive symptoms.

Implicit Loneliness as a Moderator of Emotion Regulation-Depression Associations

Our primary hypothesis was that relations of emotion regulation with depressive symptoms would be moderated by implicit loneliness. Results of multiple regression analyses are presented in Table 3, with emotional expression predictors (explicit and implicit) in the upper panel and emotional processing predictors (explicit and implicit) in the lower panel. Significant main effects of both explicit emotional expression and implicit negative emotional expression on depressive symptoms were not qualified by interactions with implicit loneliness. However, implicit positive emotional expression showed a statistically significant interaction with implicit loneliness in predicting symptoms. To probe this interaction, simple slopes were estimated at mean and +/− 1 SD of implicit loneliness. Slopes indicated that implicit expression of positive emotion was significantly associated with lower depressive symptoms among lonelier women only, $b = -0.95$, SE = 0.43, $p = .028$, and not among women average ($b = -0.33$, SE = 0.30, $p = .26$) or low ($b = 0.29$, SE = 0.43, $p = .50$) in implicit loneliness (see Figure 2a).

With regard to emotional processing, neither explicit processing nor implicit insight-oriented processing was significantly associated with depressive symptoms, and neither was moderated by implicit loneliness. However, implicit causal processing interacted with implicit loneliness to predict symptoms: among women high in implicit loneliness, implicit causal processing predicted significantly higher depressive symptoms, $b = 2.52$, SE = 0.87, $p = .004$ (see Figure 2b). Implicit causal processing did not predict depression among women average ($b = 0.63$, SE = 0.61, $p = .30$) or low ($b = -1.26$, SE = 0.88, $p = .15$) in implicit loneliness.

Discussion

The present study supported the hypotheses that among women coping with breast cancer, implicit and explicit processes of emotion regulation show distinct relations with depression, and their effects depend in part on implicit processes of loneliness. Consistent with past research (e.g., Stanton, Danoff-Burg et al., 2000), women who reported coping with cancer by expressing emotions reported fewer depressive symptoms three months later as compared to those with low emotional expression. This finding supports the notion that conscious use

of emotional approach coping—expressing emotions actively rather than avoiding them—is an adaptive response to the challenges of breast cancer. By contrast, the emotional processing component of approach coping, which involves cognitive engagement, was not associated with depression, contradicting previous work with healthy samples (Stanton, Kirk et al., 2000), but consistent with evidence that processing has weaker effects than expression in breast cancer samples, and may even predict increased distress after accounting for the benefits of expression (Stanton, Danoff-Burg et al., 2000).

Results regarding emotional approach at the implicit, behavioral level paint a more complex picture. Women whose narratives of their experience with cancer included higher proportions of negative emotion words reported more depressive symptoms three months later. Although this evidence at the implicit level seems to contradict the adaptive role of emotional approach, it may instead reflect maladaptive rumination on negative affect, which can begin as an active coping effort but—unlike emotional approach coping—persists as passive, perseverative dwelling on distress (Marroquín et al., 2010; Nolen-Hoeksema et al., 2008). Successful emotional approach coping—especially with respect to depression—potentially involves the expression of both negative and positive emotions, and the resolution of short-term emotional distress in an effective, flexible manner. We note that our implicit measure of emotional expression distinguished between negative and positive emotions in a way our explicit measure did not (i.e., in the explicit measure, women were asked to report on emotion expression overall). In comparing implicit expression, then, it is important to consider that our measure captures valence-specific emotional expression rather than the mix of emotions (including positive emotions) potentially captured by explicit measures of expression.

Consistent with hypotheses, findings suggest that some implicit aspects of emotion regulation are uniquely relevant for lonely women. Only among women higher in implicit loneliness, expressing less positive emotion and engaging in more causal processing during the essay task predicted higher depressive symptoms. The fact that these patterns were not apparent among less lonely women supports the hypothesis that intrapersonal emotion regulatory processes have stronger effects on depression and other mental health outcomes among more socially isolated individuals (Marroquín, 2011; Marroquín & Nolen-Hoeksema, 2015). The present findings are also consistent with evidence implicating dampened positive emotion (e.g., Bylsma et al., 2008) and elevated causal processing (e.g., rumination; Nolen-Hoeksema et al., 2008) in depression. They additionally suggest that perceived unavailability of relationships—even at an implicit level—confers vulnerability to the maladaptive influences of such depressive processes, whereas social connectedness may buffer against such influences.

These findings have several implications for the relations among loneliness, emotion regulation, and depressive symptoms in the context of coping with cancer. A primary contribution of the present study is that it overcomes limitations of individuals' conscious access to their automatic processes, as well as social desirability, self-presentation, ability and willingness to introspect about loneliness, and the cognitive demands of verbal report. Findings suggest that implicit processes of emotion regulation—specifically, emotional expression and processing in response to the breast cancer experience—differ from explicit

processes captured in self-report measurement. Moreover, the present findings address questions of both how loneliness affects outcomes in mental and physical health (Hawkley & Cacioppo, 2010) and how social-cognitive contexts affect emotion regulation in depression (Marroquín, 2011). Although consistent with evidence that effortful, conscious emotion regulation is directly linked with depression in general and among patients with cancer, the present study also advances understanding of emotion regulatory processes that occur at a more automatic level (Koole & Rothermund, 2011). It also identifies implicit loneliness as a social-cognitive mechanism through which social factors influence intrapersonal emotion regulation and depression, a critical gap in understanding relational aspects of psychopathology (Marroquín, 2011).

Although this study advances understanding of the implicit processes of loneliness and emotion regulation in cancer and depression, limitations should be noted. First, we examined a period late in the treatment course because this is a point at which initial social support increases have abated (Thompson et al., 2013), making loneliness a potentially more salient factor in regulation and depression. Future research is required to examine whether implicit processes are also implicated in earlier coping responses to more immediate stressors of diagnosis and treatment. Second, the present study did not include an explicit measure of loneliness concurrent with the IAT-L. The IAT-L has shown independence from explicit loneliness in past work (Nausheen et al., 2007; Nausheen et al., 2010), but most research on loneliness in physical health and depression has relied on self-report. Importantly, implicit loneliness as measured by an IAT represents the individual's associations of the "self" category with "lonely" *relative* to "nonlonely." That is, the measure represents the relative strength of internal representations (one's internal "index" of loneliness) rather than absolute levels of loneliness captured in explicit measures. The present findings should be considered within that distinction. Future work is needed to address incremental contributions of implicit processes of loneliness, and whether they tap the same construct (i.e., whether the implicit "sense" of being lonely differs from explicitly viewing oneself as having distressingly inadequate social relationships). Relatedly, although our approaches to explicit and implicit phenomena converge on emotion expression and processing as constructs, it must be noted that they are not redundant (and indeed, are expected to be non-overlapping). For example, implicit emotion expression as indexed by use of emotion words in a private, verbal task is not the same as other behaviors potentially captured by explicit items like "I take time to express my emotions," such as crying, laughing, or sharing emotions with others.

Third, the present design is unable to address causality or directionality definitively among the variables of interest. Although depressive symptoms were measured three months after emotion regulation and loneliness, the present findings may reflect co-occurring phenomena linked with depression, rather than prospective influences on symptom change. Future work should aim to distinguish implicit processes of loneliness and emotion regulation as contributors to versus concomitants of depression among women coping with breast cancer; both patterns are of interest for understanding the psychopathology and treatment of depression in the context of cancer survivorship. Similarly, it will be important to examine how positive emotional expression relates to individual differences, like optimism, that are known to play protective roles in mental health and well-being when coping with cancer

(e.g., Carver et al., 2005). It is possible that such personality characteristics linked with tendencies to include positive expression when reflecting on one's experience with cancer are themselves especially influential in the context of loneliness.

Despite these limitations, the present findings have implications for prevention and intervention in the course of cancer. Differences between implicit and explicit emotion regulation suggest that it may be difficult for patients to identify and communicate all of the internal experiences that fuel depression as they attempt to cope with cancer. Importantly, the present results suggest special attention should be paid to women who are lonely or socially isolated at this phase in treatment, when initial social support can begin to subside. Providers, supporters, and patients themselves may be able to monitor some emotion regulatory efforts during treatment that are known to play beneficial or maladaptive roles, but these do not necessarily align with more subtle, nonconscious mechanisms of regulation. Such processes are inherently more difficult to assess, but interventions targeting mindfulness (i.e., developing skills in observing, reflecting on, and labeling one's thoughts and emotions) can potentially bring such processes to a conscious level, where they can be addressed in cognitive and emotion-focused therapies. Even without such awareness, focusing clinical attention toward patients' relational health and interpersonal connectedness, including psychoeducation for patients and supporters regarding the importance of the social context in coping, might defuse vulnerability to maladaptive implicit coping efforts. Paired with understanding women's explicit, conscious efforts at emotion regulation, improved awareness of implicit processes may further elucidate links among the social, cognitive, and emotional systems implicated in depression, with potential applications for improving physical and mental health among the many women who face breast cancer.

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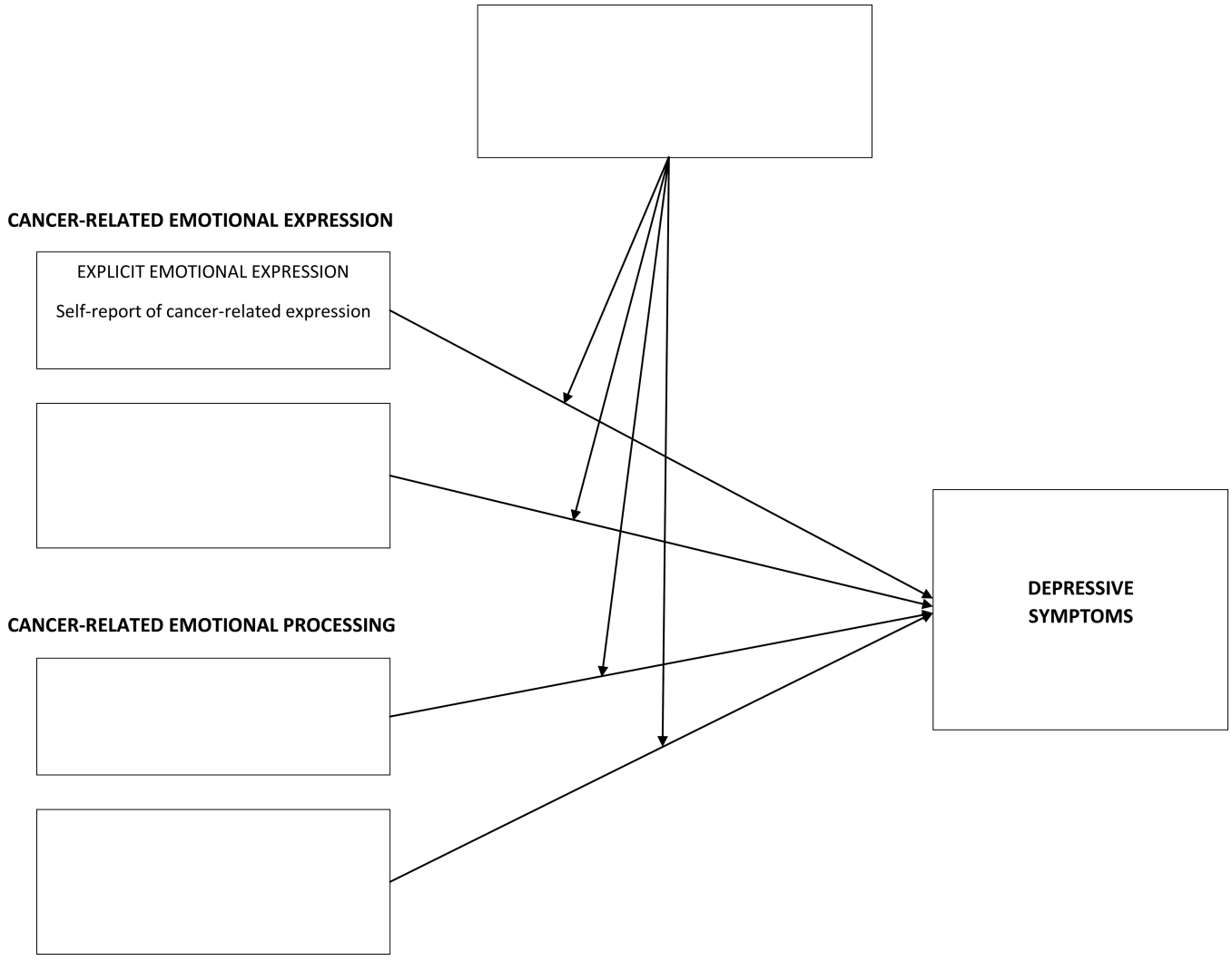
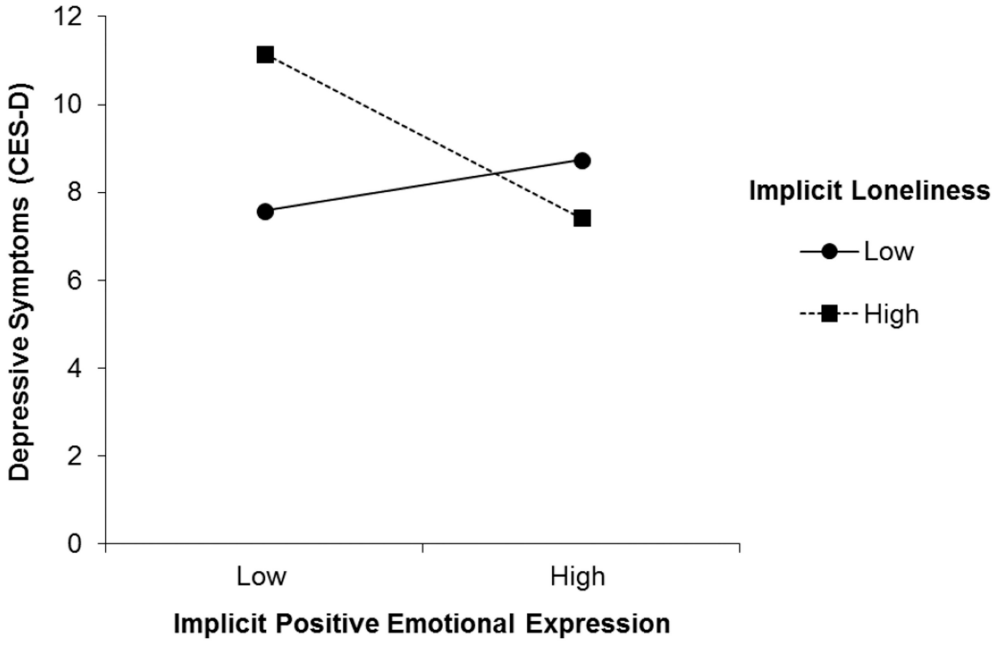


Figure 1.
Implicit loneliness as a social-cognitive moderator of cancer-related emotional expression and processing associations with depressive symptoms.



(a)

(b)

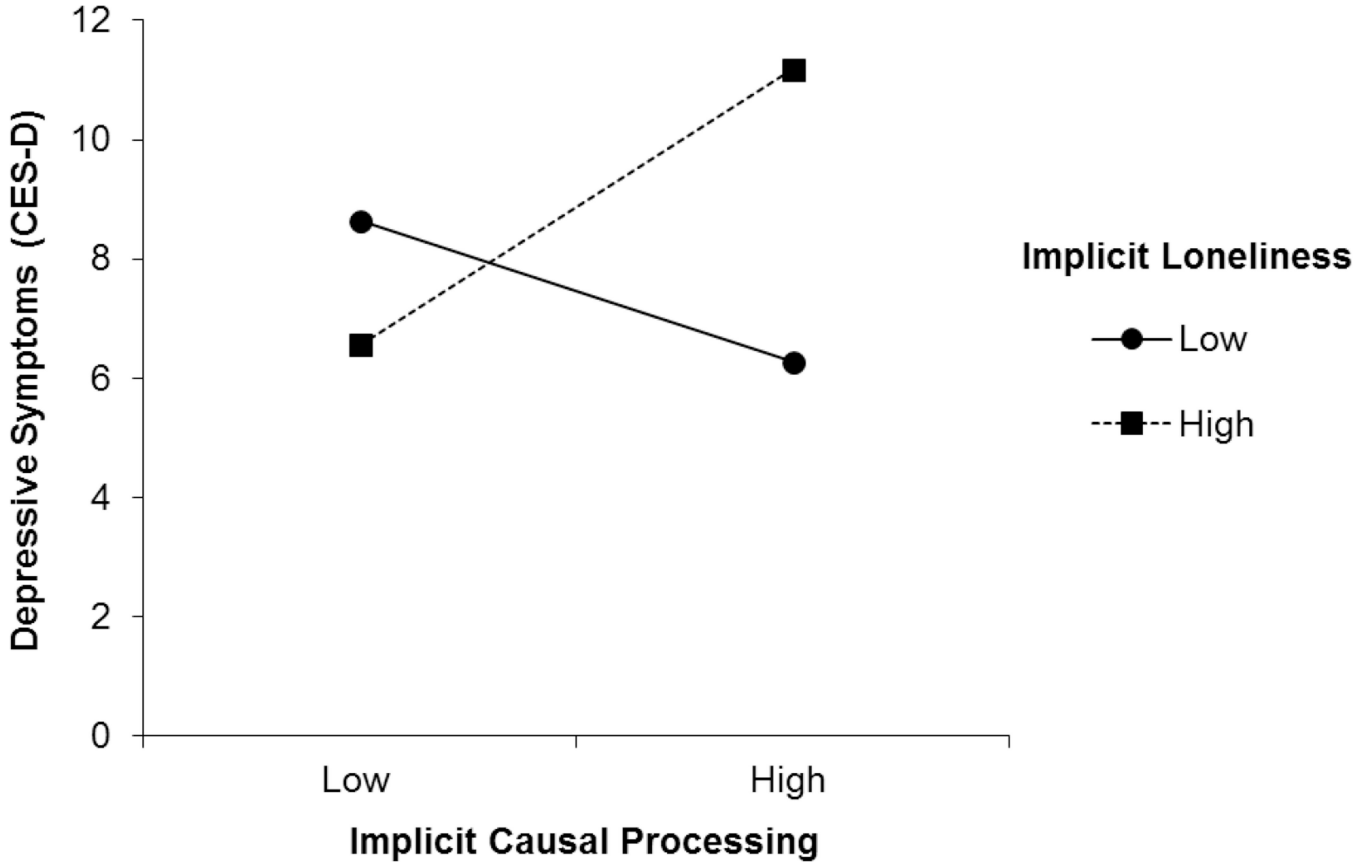


Figure 2.
Implicit loneliness moderates relations of (a) implicit positive emotion expression and (b) implicit causal processing with depressive symptoms (values plotted at +/− 1 SD).

Table 1

Sample Demographic and Treatment Characteristics at 9-Month Session (N = 390)

Demographics	Mean (SD) or N (%)	Treatment	N (%)
Age	57.0 (12.23) Range = 24–91	*Cancer Stage*	
Ethnicity		Stage 1	175 (45%)
White/European American	266 (68%)	Stage 2	155 (40%)
Latina	75 (19%)	Stage 3	44 (11%)
Asian/Asian-American	19 (5%)	Stage 4	16 (4%)
Native American	11 (3%)	*Chemotherapy*	
Black/African American	7 (2%)	Current	11 (3%)
Multiracial	8 (2%)	Completed	188 (48%)
Other/unreported	4 (1%)	None	191 (49%)
Relationship Status		*Radiotherapy*	
Married/Living as married	258 (66%)	Current	13 (3.3%)
Committed, not cohabiting	10 (3%)	Completed	135 (35%)
Never married	24 (6%)	None	242 (62%)
Divorced/separated	59 (15%)	*Endocrine Therapy*	
Widowed	35 (9%)	Current	232 (60%)
Did not report	4 (1%)	Completed	22 (6%)
Household Income		None	136 (35%)
< $50,000	110 (28%)	*Surgery*	
$50,000–74,999	81 (21%)	Current	47 (12%)
$75,000–100,000	51 (13%)	Completed	312 (80%)
> $100,000	128 (33%)	None	31 (8%)
Did not report	20 (5%)		
Education			
Less than high school	13 (3%)		
High school	82 (21%)		
2 years of college	75 (19%)		
4-year college degree	140 (36%)		
Master’s degree	54 (14%)		

Demographics	Mean (SD) or N (%)	Treatment	N (%)
M.D., Ph.D., Prof. degree	21 (5%)		
Did not report	5 (1%)		
Employment Status			
Employed	196 (50%)		
Retired	120 (31%)		
Unemployed	69 (18%)		
Did not report	5 (1%)		

Current treatment = treatment administered within the past 3 months. Completed treatment = treatment administered prior to but not within the last 3 months.

Table 2

Descriptive Statistics and Zero-Order Correlations among Study Variables

	IAT-L	EAC Expression	EAC Processing	LIWC Negative Emotion	ZLIWC Positive Emotion	LIWC Causation	LIWC Insight	CES-D (12 months)
IAT-L	−0.20 (0.50)							
EAC Expression	−.13*	2.94 (0.80)						
EAC Processing	−.10	.69**	2.94 (0.73)					
LIWC Negative Emotion	−.03	−.10	−.02	2.45 (1.47)				
LIWC Positive Emotion	.03	.08	.05	−.30**	4.57 (1.95)			
LIWC Causation	.001	−.06	.04	.13*	−.13*	1.64 (0.92)		
LIWC Insight	.10	.04	.07	−.005	−.11	.09	3.47 (1.40)	
CES-D (12 months)	.08	−.19**	−.04	.18**	−.09	.11	−.05	7.10 (8.46)
Observed N	327	386	386	294	294	294	294	365
Range	−1.31, 1.27	1.00, 4.00	1.00, 4.00	0.00, 9.86	0.47, 10.61	0.00, 6.10	0.00, 8.39	0.00, 53.00

Means and standard deviations are shown on the diagonal. IAT-L = Implicit Association Test for Loneliness (Nausheen et al., 2007); EAC = Emotional Approach Coping scales, Emotional Expression and Emotional Processing subscales (Stanton et al., 2000). LIWC = Linguistic Inquiry and Word Count (Pennebaker et al., 2007) percentages of participant's essay sample matching the language category. CES-D = Center for Epidemiologic Studies Depression scale (Radloff, 1977). All variables measured at 9 month assessment, except depressive symptoms, measured at 12 month assessment.

* $p < .05$;

** $p < .01$.

Table 3

Implicit Loneliness as a Moderator of Emotion Regulation Relations with Depressive Symptoms

	Emotion Regulation Predictors: Emotional Expression		
	EAC Emotional Expression	LIWC Negative Emotion	LIWC Positive Emotion
IAT-L	.49 (4.04)	.84 (2.66)	6.84 (2.99) *
ER Predictor	−1.64 (.62) **	1.29 (.58) *	−.58 (.32) +
IAT X ER	.07 (1.27)	.22 (1.12)	−1.25 (.63) *
R^2	.11 **	.13 **	.11 **
	Emotion Regulation Predictors: Emotional Processing		
	EAC Emotional Processing	LIWC Causation	LIWC Insight
IAT-L	−2.37 (3.66)	−4.82 (2.18) *	−.27 (3.11)
ER Predictor	−.41 (.65)	1.37 (.65) *	−.20 (.47)
IAT X ER	1.15 (1.21)	3.80 (1.26) **	.46 (.85)
R^2	.09 *	.13 **	.09 *

Values are unstandardized regression coefficients with standard errors in parentheses. Models are adjusted for the following covariates: age; relationship status; cancer stage; and treatment at 9 months (radiation, chemotherapy, and endocrine therapy). ER =emotion regulation; IAT-L = Implicit Association Test for Loneliness (Nausheen et al., 2007); EAC = Emotional Approach Coping scales, Emotional Expression and Emotional Processing subscales (Stanton et al., 2000). LIWC = Linguistic Inquiry and Word Count (Pennebaker et al., 2007). CES-D = Center for Epidemiologic Studies Depression scale (Radloff, 1977). All variables measured at 9 month assessment, except depressive symptoms, measured at 12 month assessment.

+ $p < .10$;

* $p < .05$;

** $p < .01$.