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## Living With Limited Time: Socioemotional Selectivity Theory in the Context of Health Adversity

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### Abstract

The current research was designed to test the applicability of socioemotional selectivity theory (SST; Carstensen, 2006), a life span theory that posits that perceived time remaining in life (time perspective) is a critical determinant of motivation, to individuals who face foreshortened futures (limited time perspective) due to life-limiting medical illness. In Study 1, we investigated whether life goals and biases in attention and memory for valenced emotional stimuli differed between women living with metastatic breast cancer ( $n = 113$ ; theoretically living under greater limited time perspective than peers without cancer) and similarly aged women without a cancer diagnosis ( $n = 50$ ; theoretically living under greater expansive time perspective than peers with cancer) in accordance with SST. As hypothesized, metastatic group goals reflected greater emphasis on limited versus expansive time perspective relative to comparison group goals. Hypotheses regarding biases in attention and memory were not supported. Study 2 followed metastatic group participants over 3 months and revealed that, consistent with hypotheses, whereas limited time perspective goals predicted decreased intrusive thoughts about cancer, expansive time perspective goals predicted decreased perceived cancer-related benefits. Together, these studies suggest that SST is a useful lens through which to view some components of motivation and psychological adjustment among individuals confronting medically foreshortened futures.

### Keywords

socioemotional selectivity theory; time perspective; metastatic breast cancer; positivity effect; goal adjustment

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All people face a lifetime of uncertain length but one that is certainly finite. How does the awareness of both one's ultimate fate and one's probable proximity to it influence the life one chooses to lead? Guided by a life span theory of motivation, socioemotional selectivity theory (SST; Carstensen, 2006; Carstensen, Isaacowitz, & Charles, 1999), we undertook the

present research to investigate how receiving a diagnosis of a life-limiting illness influences motivation and how certain motivational states may bolster psychological adjustment. We designed two studies to test in an ecologically valid manner the applicability of SST to individuals facing medically foreshortened futures. In Study 1, we explored whether and how life goals and cognitive biases for emotional stimuli vary between two groups of individuals, women diagnosed with metastatic breast cancer (i.e., breast cancer that has spread beyond the breasts and axial lymph nodes to distant organs/bones) and similarly aged women with no known breast cancer history. Study 2 then used a prospective design in the same sample of women with metastatic breast cancer to examine how emphasis on limited versus expansive time perspective goals predicted psychological adjustment. Together, the studies explored how SST tenets apply in situations in which temporal horizons have been constrained by a medical diagnosis and the utility of SST for understanding psychological adjustment in this context.

How might motivation vary systematically when individuals encounter diagnosis of a life-threatening disease? To address this question in a naturalistic setting, we compared both self-reported life goals and preferences in attention and memory for emotional stimuli between two groups of similarly aged women who faced life circumstances that theoretically should engender differences in the length of time they perceive likely remains in life, or time perspective. Metastatic breast cancer typically is life-limiting; currently, 24% of women first diagnosed with metastatic (Stage IV) breast cancer are expected to live for at least five years, with a somewhat lower survival rate for recurrent disease (American Cancer Society, 2013; Dawood et al., 2011). Because women with metastatic breast cancer theoretically are living under conditions of more limited time perspective than their similarly aged peers, we sought to investigate whether preferences in attention, memory, and life goals align with this incongruity. The opportunity to explore these questions outside the context of natural aging or an experimental setting is unusual and provides a rich and complex context for investigating goal selection and attention to emotional stimuli near the end of life.

SST posits that humans select goals in accordance with their placement in the life span for the purpose of maximizing life satisfaction (Carstensen, 2006; Carstensen et al., 1999). Research demonstrates that young people, endowed with the expectation of lengthy futures, prioritize goals related to acquiring knowledge, such as exploring new interpersonal relationships and learning about novel subjects of interest; in contrast, older adults, who perceive time to be more limited, tend to favor goals related to maximizing emotional satisfaction in the present moment, such as deepening already intimate relationships (Carstensen, 1992; Carstensen & Fredrickson, 1998; Fredrickson & Carstensen, 1990; Gross et al., 1997). Thus, time perspective influences the particular types of goals that people are most interested in pursuing.

In addition to its effects on goal selection, time perspective may also influence other cognitive processes, such as attention and memory. Mather and Carstensen (2003) investigated the potential effects of time perspective on attention and memory using a quasi-experimental design in older and younger adults. The dot-probe task they developed assesses biases in attention and memory for positively and negatively valenced emotional stimuli. During the task, participants are presented with a series of pairs of faces on a computer

screen. Within each pair, one face presents a neutral expression and one face presents an emotional expression (happy, sad, or angry). Immediately after the faces disappear from the screen, a dot appears behind one of the faces, and participants are instructed to identify as quickly as possible on which side of the screen the dot appeared. Hence, the task assesses attentional biases by comparing reaction times (RTs) across trials of differently valenced faces. Participants also complete a recognition task after the attention trials in which they are asked to identify whether individual faces were presented in the previous portion of the task. On trials of happy emotional faces, older adults reacted more quickly when the dot appeared behind the emotional (happy) face, whereas on trials of negative emotional (angry/sad) faces, older adults reacted more quickly when the dot appeared behind the neutral face, suggesting that older adults selectively attend toward positive emotional faces and away from negative emotional faces (Mather & Carstensen, 2003). Younger adults did not show this pattern. Similarly, older adults showed superior memory for positive faces relative to negative faces, whereas younger adults showed no valence bias in memory.

This preference for positive emotional information that emerges over the life course has been coined the “positivity effect” and has been demonstrated in autobiographical memory, long-term memory, working memory, and attention (Carstensen, Mikels, & Mather, 2006; Charles, Mather, & Carstensen, 2003; Isaacowitz, Wadlinger, Goren, & Wilson, 2006; Kennedy, Mather, & Carstensen, 2004; Mather & Carstensen, 2005; Mikels, Larkin, Reuter-Lorenz, & Carstensen, 2005; Schlagman, Schulz, & Kvavilashvili, 2006). According to SST, older adults are drawn toward positive emotional stimuli and away from negative emotional stimuli because these preferences are consistent with their present-focused motivational framework. Without the expectation of lengthy futures, older adults are motivated to attend to emotional information that is satisfying rather than unpleasant in the present moment. In contrast, the theory holds that younger adults show either no bias or sometimes even a bias toward negative emotional information because such information (e.g., my employer looks unhappy when I arrive late) may prove useful in avoiding unpleasant future events. However, to what extent this empirically observed *age*-related preference for positive emotional information is attributable to differences in time perspective is less clear. Alternative explanations for the positivity effect have been offered, including the possibility that older adults’ bias toward positive/away from negative emotional information might represent a serendipitous age-related neural and/or cognitive decline in the ability of the amygdala to process negative emotions (Cacioppo, Berntson, Bechara, Tranel, & Hawkley, 2011; Labouvie-Vief, 2003). Even if changes in time horizons contribute to the development of a positivity bias, it is also likely that older adults’ preferences and emotion regulatory capacities arise at least in part out of years of practicing these skills, not merely as a result of limited time perspective.

Furthermore, data suggest that the theoretical emotional good tidings of limited time perspective may selectively emerge among older adults.<sup>1</sup> Fung and Carstensen (2006) investigated social partner preference, a construct linked theoretically and empirically to time perspective, among younger and older adults in Hong Kong during the SARS epidemic

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<sup>1</sup>We are grateful to an anonymous reviewer for highlighting this research.

and found that age interacted with social partner preference in predicting distress over time. Maintaining a diverse and diffuse social network that includes numerous members with whom one shares only loose emotional bonds, as should theoretically be observed in individuals with expansive time perspective, facilitates the pursuit of information-seeking goals because these individuals constitute a rich body of knowledge and potential for development of future contacts that may be instrumentally useful in the future (English & Carstensen, 2014). In contrast, choosing to focus energy on more intimate members of one's social network likely facilitates fulfillment of emotionally salient goals, and hence should be more prominent in individuals with limited time perspective. SST predicts that an event such as the SARS outbreak in Hong Kong, in which the limitations on life appear in stark relief, should influence younger adults toward a preference for intimate social partners (e.g., family) over novel social partners (e.g., a book author) in a task in which they are asked to imagine having 30 min to spare and can choose to spend the time with one of these partners. Whereas this preference for the intimate partner has been observed among the general older adult population under everyday circumstances, younger adults typically demonstrate no preference *unless* their time perspective is experimentally or naturalistically manipulated. As predicted, during the height of the SARS epidemic, both older and younger adults disproportionately selected to spend time with the intimate social partner and did so at the same rate. Consistent with SST, when the height of the epidemic had passed, older adults were more likely to select the intimate social partner than were younger adults.

Critical for the purposes of this study, a subsample of participants also rated their distress associated with the SARS epidemic at both time points. After controlling for baseline distress, baseline social partner preference interacted with participant age in predicting distress at follow-up, such that among *younger* adults, selection of the intimate partner at baseline was associated with a smaller reduction in distress over time. There was a nonsignificant trend among older adults in the opposite direction (i.e., selection of the intimate partner at baseline was associated with increased distress reduction). Hence, the data suggested the possibility that shifting preferences theoretically associated with time perspective in response to a nonnormative event may impede psychological adjustment and maintain negative affect for younger adults.

Although to our knowledge no studies have considered systematic SST-predicted differences in general life goals as a function of health status, Carstensen and Fredrickson (1998) conducted a series of studies investigating mental representation of social partners among healthy younger and older adults as well as similarly aged groups of individuals who varied in health status. First, they asked younger and older adults to think about how they would feel interacting with a variety of potential social partners and then to group partners in categories by virtue of how similar they believed the experience of interacting with the partner would be. As SST predicts, older adults placed more weight on the "affective potential" of the partner in comparison to the "future contact" utility of the partner or the "information-seeking" value of the partner relative to younger adults (Carstensen & Fredrickson). Is it time perspective that drives this effect, or might it be that, having had more time in which to develop intimate bonds, older adults come to place more value on close social ties?

To disentangle effects of time perspective from effects of chronological age, Carstensen and Fredrickson (1998) conducted a study employing the partner representation paradigm described above in three groups of men who varied in health status but who did not vary in chronological age (mean age was 37 years): HIV-negative men, HIV-positive but asymptomatic men, and HIV-positive and symptomatic men. Symptomatic HIV-positive men displayed the same bias as older adults, namely showing a greater tendency to classify social partners by their “affective potential” than the other two groups. Thus, there is preliminary evidence that differences in health status, which are associated with differences in expected survival time, influence how individuals mentally represent social partners.

In sum, although there is a substantive evidence base for the theoretical framework of SST, there remains intriguing ambiguity regarding how the framework applies when individuals confront the end of life through means other than natural aging. Specifically, how living with a chronic, life-limiting illness may influence motivation (e.g., life goals and cognitive biases) and how potential shifts in motivation impact psychological adjustment are open questions. Exploring these questions in the setting of metastatic breast cancer offers a unique opportunity to expand upon the existing research. The current research represents a conservative test of SST for a number of reasons. First, women with metastatic cancer are coping with significant health adversity in addition to the end of life. Second, women likely vary in the extent to which they perceive their time to be limited. Indeed, it is possible that every week living with the disease could serve as evidence of success in pushing death further away or, conversely, could trigger thoughts that time is running out. Third, for some women, the presence of healthy partners or children who are not confronting medically imposed limited time perspective may naturally influence them to focus on the future and hence expansive time perspective or to focus more on close others and potential associated losses and hence limited time perspective. Recognizing these complexities, we aimed to explore the flexibility of SST and how its principles could guide an investigation of motivation and psychological adjustment in women living with metastatic breast cancer.

## Overview and Predictions for Study 1

Study 1 was designed to extend the work of Carstensen and colleagues by using the SST lens to evaluate cognitive biases and a broad range of life goals in a previously unexplored population for which health status has theoretically altered time perspective. In Study 1, women living with metastatic breast cancer and a sample of age- and education-matched women without a cancer diagnosis reported the goals that they typically pursue and completed the Mather and Carstensen (2003) dot-probe task. Reported goals were coded for six dimensions theoretically related to limited and expansive time perspective. Consistent with SST, in Study 1 we hypothesized that goals from the metastatic sample would demonstrate significantly more preference for limited time perspective than the comparison sample’s goals. We did not predict that goals from the comparison sample would evidence the opposite preference because diversely aged healthy women should exhibit significant variation in life goals, and therefore we did not expect a preference in either direction. We also explored within-group goal preferences and made one specific prediction: Because shifts in time perspective and associated life goals may take time to occur, we examined whether women who have been living with the diagnosis of metastatic breast cancer for

longer time periods demonstrate the hypothesized goal preferences more strongly than women diagnosed more recently.

Guided by the previous findings for older adults versus younger adults on the dot-probe task (Mather & Carstensen, 2003), our hypothesis was that the task performance of women with metastatic cancer versus comparison group women would resemble that of older adults versus younger adults. In light of the disparate explanations regarding the underpinnings of the positivity effect and the finding that selection of a limited-time-perspective social partner was associated with maintained negative affect over time during the SARS epidemic, this prediction was ambitious. However, SST lays the groundwork for the possibility that out of the ashes of the enormous challenge of confronting mortality at a nonnormative age may paradoxically emerge a selective attention toward positive emotional information that is relatively more rewarding in the moment. Specifically, we predicted that women in the metastatic group would demonstrate preference for (i.e., would respond more quickly to) positive in comparison to negative faces as well as superior memory for positive/neutral relative to negative/neutral faces, whereas women in the comparison group would demonstrate these preferences not at all or to a lesser extent. In an effort to isolate the effect of time perspective, as opposed to subjective physical health or placement in the life span, on cognitive biases, we included chronological age and a measure of physical health as covariates. Because depressive symptoms are known to influence cognitive biases for emotional information (and have been shown to do so in this specific task; see Joormann & Gotlib, 2007), we also included depressive symptoms as a covariate.

## Method

**Metastatic Sample Participants**—Women ( $n = 178$ ) with metastatic breast carcinoma were introduced to the study at University of California, Los Angeles (UCLA) oncology clinics and a community breast cancer practice. Of these, 115 (65%) women enrolled and completed the initial interview in which current life goals were collected. Most women who declined to participate cited being too ill or too busy. Eligibility criteria were (a) a diagnosis of metastatic breast cancer; (b) ambulatory and physician-estimated survival of six months or longer; and (c) the ability to read, write, and converse in English. Two participants did not report any current life goals, leaving 113 participants for analysis. Participants received \$25.00 for completion of this assessment.

**Comparison Sample Participants**—Women who had never received a diagnosis of cancer, did not have a familial breast cancer history, and were fluent in English were recruited through flyer/advertisements posted at UCLA and in the *Los Angeles Times* newspaper. To match the two samples on age, we computed the percentage of participants in each 5-year age increment of the metastatic sample and recruited the same percentage of comparison group women in each age category. We also recruited the same fraction of women in each of four levels of education (i.e., high school, some college, college degree, postgraduate work). Potential participants ( $n = 122$ ) contacted the research team by phone and were assessed for eligibility; 52 women (43%) were ineligible, most often because the appropriate age category had been filled. Of the 70 women, 11 (16%) could not be contacted, 59 (84%) enrolled and, of these, 50 (85%) completed the study. Participants

received \$40.00. The group difference in compensation was a result of distinct funding sources.

**Metastatic Sample Procedure**—Research staff introduced the study at an oncology clinic appointment, and women provided written informed consent. Interviews of approximately 90 min, during which Emmons’s (1986) Strivings List was conducted and measures described below were completed, along with additional assessment not relevant to the present report (Algoe & Stanton, 2012; Stanton & Low, 2012), took place at either the participant’s home, an oncology clinic, or over the phone if traveling distance was prohibitive. Interviews were conducted by graduate students in the UCLA clinical psychology PhD program or trained postbaccalaureate research assistants.

**Comparison Sample Procedure**—Participants learned about the study via flyer/ advertisement and were assessed for eligibility when they contacted the research staff via phone. Staff scheduled appointments for eligible women, who provided written informed consent. At a 90-min interview and questionnaire session at UCLA, the Strivings List and other measures were completed. Postdoctoral scholars, graduate students, and trained postbaccalaureate research assistants conducted all interviews.

### Measures

**Assessment of life goals:** The extent to which women endorsed goals associated with limited and expansive time perspective was assessed during the interview using the Strivings List (Emmons, 1986). Participants listed up to 20 goals, or “strivings,” that they were currently seeking in their everyday behavior. They were provided with examples of potential strivings (e.g., “Trying to be a good role model for others” and “Trying to develop my spirituality”) and encouraged to note that strivings were phrased in terms of what they were trying to do regardless of whether or not they were actually successful. Participants were informed that strivings may be fairly broad (e.g., “Trying to make others happy”) or more specific (e.g., “Trying to make my partner happy”) and may pertain to something that they were trying to initiate, maintain, or change. Participants were given as much time as they needed to list at least five strivings.

Two independent raters (the first author and a trained postbaccalaureate research assistant) coded each goal reported on the Strivings List for the presence of three dimensions of limited time perspective and three dimensions of expansive time perspective. Because data from the metastatic group were collected and coded prior to the recruitment of the comparison group, raters were not blind to group membership. Raters considered whether goals were related to (a) enjoying the present moment, (b) maximizing emotional satisfaction, (c) spending time with close social partners, (d) planning for the future, (e) acquiring knowledge, and (f) meeting new people or spending time with distant social partners. The first three ratings reflect dimensions of limited time perspective, and the other ratings reflect expansive time perspective. For each goal, raters gave a score of “1” if the dimension was present and a score of “0” if the dimension was absent. Each dimension was scored without regard to scores on other dimensions, so any particular goal could receive a score of “1” on all six indicators or a score of “0” on all six indicators (i.e., all score



combinations were possible). Agreement between two raters was 91% for the comparison group and 93% for the metastatic group; disagreements were resolved by a third rater (a postdoctoral scholar). Scores for each of the six time perspective dimensions were calculated separately by summing an individual's score on each dimension and dividing by the total number of goals. We also calculated three scores representing time perspective: composite limited time perspective (sum of Dimensions a, b, and c for all reported goals divided by the number of goals), composite expansive time perspective (sum of Dimensions d, e, and f for all goals reported divided by the number of goals), and a ratio score of limited to expansive time perspective (limited time perspective score divided by the sum of the limited and expansive time perspective scores). Examples of goals coded as more expansive are "exercise daily," "organize my materials for my job," and "learn more about my disease and drugs." Goals such as "spend more time with people important to me," "enjoy one moment," and "be a good role model for others" were coded as more limited.

**Health status among women with metastatic disease:** Data on number of comorbid chronic health conditions, tumor estrogen receptor status (positive status is typically associated with more favorable prognosis), and number of bodily sites to which cancer had metastasized were collected via interview. To assess perceived illness-related stress, participants responded to the questionnaire item, How stressful is your experience with cancer? (1 = *not at all stressful*, 5 = *extremely stressful*). Women also completed the Medical Outcomes Study Short-Form Health Survey (MOS-SF-36; Ware & Sherbourne, 1992), a 36-item scale to assess quality of life (see Ware, Kosinski, & Keller, 1994, for psychometric properties). The measure is composed of two primary subscales: (a) the Mental Component Summary (MCS), comprising four subscales (role function-emotional, social functioning, mental health, vitality), and (b) the Physical Component Summary (PCS), comprising four subscales (physical functioning, role function-physical, bodily pain, general health).

**Depressive symptoms:** Participants completed the Center for Epidemiologic Studies Depression Scale (CES-D; Radloff, 1977), a 20-item measure used widely to screen for depression. The CES-D has been shown to have good internal consistency (coefficient  $\alpha = .89$ ) and adequate test-retest reliability ( $r = .57$ ) in cancer patient populations (Hann, Winter, & Jacobsen, 1999). Internal consistency in the current study was  $\alpha = .89$ .

**Attention and memory for emotional faces:** The dot-probe task was programmed in E-Prime following the procedure and using the 60 pairs of face photographs of Mather and Carstensen (2003). A pair consisted of two photographs of the same individual presented side-by-side on a computer screen; each pair included one neutral face and one emotional face (happy, sad, or angry). There were 20 happy-neutral face pairs, 20 sad-neutral face pairs, and 20 angry-neutral face pairs. Sixty different individuals, half men and half women, were featured. Any person's face was featured in only one emotion category, and within each category 10 faces were female and 10 faces were male. Two faces were used for practice trials.

Following Mather and Carstensen (2003), the dot-probe task included an attention task, followed by a 10-min delay, and then a surprise recognition task. Participants were told that they would be completing a computer task exploring perceptual processes. The researcher

instructed participants that they would see a dot appear on either the left or right side of the screen and that their task was to respond as quickly as possible by pressing either the *d* key marked with a blue sticker if the dot appeared on the left side or the *k* key marked with a red sticker if the dot appeared on the right side. They were informed that, prior to the appearance of the dot, they would see two faces but that they did not need to respond to the faces in any way and should instead wait for the dot and press the appropriate key as quickly as possible. Participants completed four practice trials observed by the experimenter.

The 60 face pairs were divided into two groups, A and B, each consisting of 10 happy–neutral, 10 sad–neutral, and 10 angry–neutral face pairs; participants saw either Group A or Group B photos during the attention task. Photos from the group that participants did not see in the attention task were used as distracters in the recognition task. Each pair was presented four times such that each participant saw all four possible combinations of emotional face location (left, right) and dot location (left, right). Hence, participants completed a total of 120 trials (30 face pairs  $\times$  4 trials per pair). Each trial followed the same sequence: (a) A fixation cross appeared in the middle of the screen for 500 ms, (b) a face pair appeared for 1,000 ms, and (c) the face pair disappeared and a small gray dot appeared in the former location of one of the photos and remained until the participant responded by pressing a key (correct and incorrect responses were both accepted). Order of presentation of face pairs was randomized for each participant.

Following the attention task, participants completed the SF-36 for 10 minutes; if participants finished the questionnaire more quickly, they were asked to sit quietly. After 10 minutes, the researcher introduced the recognition task by saying that participants would see a series of faces presented on the computer screen, some of which they had seen during the previous task and some which they had not. Participants were instructed to respond by pressing the *d* key if they had seen the face during the previous task or the *k* key if they had not. They then were presented with a series of 60 faces (i.e., both Group A and Group B photos) in randomized order. Half of both Group A and of Group B photos were shown in the neutral version and half were shown in the emotional version; which half of the faces within each group was presented in the emotional versus neutral version was counterbalanced across participants.

**Dot-probe task data reduction:** The dot-probe task was completed by 86 women in the metastatic group (women who completed the interview via phone did not perform the task) and all 50 women in the comparison group. Owing to computer recording error, data from the attention task were not recorded for one comparison group woman, and data from the recognition task were not recorded for three women in the metastatic group. Consistent with Mather and Carstensen (2003), responses to sad and angry trials for both attention and recognition were combined to create composite negative emotion scores. Following Mather and Carstensen's method, we computed positive and negative bias scores for attention. Specifically, we first trimmed all responses faster than 200 ms and then within each group trimmed the slowest 10% of responses (Joormann & Gotlib, 2007, note that extremely fast responses likely represent anticipation errors whereas extremely slow responses likely represent concentration lapses). We eliminated one participant from both the metastatic and comparison groups because the majority of responses were in the slowest 10% of their

group. To compute the positive attentional bias score, for each participant we subtracted her mean RT on positive/neutral trials when the dot appeared behind the positive face from her mean RT on positive/neutral trials when the dot appeared behind the neutral face (high scores indicate shorter RTs to positive stimuli). The negative attentional bias score was computed using the same method (high scores indicate shorter RTs to negative stimuli). As shorter RTs suggest that individuals were already attending to the face in whose location the dot subsequently appeared, higher attentional bias values indicate a bias to attend to the emotional face in the face pair.

With regard to the recognition task, like Mather and Carstensen (2003), we computed recognition accuracy as percentage of hits (faces viewed during previous attention task and accurately identified as such) minus percentage of false alarms (faces that were *not* viewed in the previous attention task and were incorrectly identified as having been viewed). Four accuracy scores were computed: (a) accuracy for faces initially seen in positive/neutral face pairs and presented at test in emotional form, (b) accuracy for faces initially seen in positive/neutral face pairs and presented at test in neutral form, (c) accuracy for faces initially seen in negative/neutral face pairs and presented at test in emotional form, (d) accuracy for faces initially seen in negative/neutral face pairs and presented at test in neutral form. Response times to the recognition task were trimmed in the same manner as for the attention task and then computed separately by valence (positive, negative), test version (emotional, neutral), and trial type (target, distracter). All recognition response time data from one metastatic group participant and one comparison group participant were excluded because most of their responses were in the slowest 10% of their respective group mean response times.

## Results

**Sample Characteristics**—Table 1 displays descriptive statistics. The mean age of women in the metastatic cancer sample was approximately 4.5 years higher than women in the healthy sample,  $F(1, 158) = 5.32, p = .022$ , reflecting recruitment of a greater number of comparison group women at the lower end of the age categories. With regard to the metastatic group, of those who reported marital status ( $n = 110$ ), 66% were married; of those who reported ethnicity ( $n = 102$ ), 82% were white, 5% were African American, 6% were Asian, 4% were Latina, and 3% were another ethnic group. Of the healthy women who reported marital status ( $n = 49$ ), 43% were married; of those who reported ethnicity ( $n = 49$ ), 70% were white, 15% were African American, 4% were Asian, 7% were Latina, and 4% were another ethnic group. Chi-square tests revealed no significant differences between groups on ethnic composition,  $\chi^2(4, N = 148) = 5.60, p = .231$ , but a significant difference was observed on marital status,  $\chi^2(1, N = 159) = 7.75, p = .005$ . Years of education,  $F(1, 153) = 0.99, p = .322$ , and annual income,  $F(1, 118) = 0.31, p = .580$ , did not differ significantly.

**Life Goals Analyses**—With regard to characteristics of goals reported by the sub-samples (see Table 1), on average women with metastatic cancer reported significantly fewer goals than women in the comparison group,  $F(1, 162) = 16.96, p < .001, \eta_p^2 = .10$ . Both groups reported a wide variety of goals, and because each goal was coded separately for each of the

six time perspective dimensions, few goals were coded as exclusively limited or exclusively expansive.

**Between-Groups Goal Repeated-Measures Analyses**—To investigate whether goals endorsed by the two groups varied systematically with regard to goal time perspective, coded goal data were submitted to a repeated-measures analysis of covariance (ANCOVA) with between-subjects factors of group (metastatic cancer, comparison) and marital status (married, unmarried) and a within-subjects factor of goal time perspective (composite limited, composite expansive). Preliminary analyses indicated that age did not interact significantly with group in predicting goal time perspective, and age was included as a covariate in all analyses.<sup>2</sup> Because a significantly greater proportion of women in the metastatic group relative to the comparison group were married, we elected to include marital status in the model.

As hypothesized, a significant Group  $\times$  Goal Time Perspective interaction indicated that women in the metastatic sample demonstrated greater preference for composite limited relative to composite expansive time perspective in their goals than women in the comparison sample,  $F(1, 152) = 10.78, p = .001, \eta_p^2 = .07$ . In analyses of relative preferences for each of the goal time perspective dimension pairs, significant Group  $\times$  Goal Time Perspective interactions were observed for present versus future,  $F(1, 152) = 12.82, p < .001, \eta_p^2 = .08$ , and emotion versus knowledge,  $F(1, 152) = 4.76, p = .031, \eta_p^2 = .03$ . In both cases, women with metastatic cancer demonstrated the predicted preference for the limited time perspective dimension (i.e., present and emotion) over the expansive time perspective dimension (i.e., future and knowledge) more strongly than comparison group women. The interaction of group and goal time perspective did not achieve significance only when comparing groups on preference for the close others versus distant others time perspective dimensions,  $F(1, 152) = 0.57, p = .452, \eta_p^2 = .00$ .

With regard to marital status, the Goal Time Perspective  $\times$  Marital Status interaction was significant when comparing: composite limited/composite expansive,  $F(1, 152) = 5.44, p = .021, \eta_p^2 = .04$ ; present/future,  $F(1, 152) = 5.17, p = .024, \eta_p^2 = .03$ ; and close others/distant others,  $F(1, 152) = 6.98, p = .009, \eta_p^2 = .04$ ; but not emotion/knowledge,  $F(1, 152) = 0.19, p = .666, \eta_p^2 = .00$ . In all analyses that achieved statistical significance, married women relative to unmarried women demonstrated greater preference for the limited time perspective dimension relative to the expansive time perspective dimension. In no case did the third-order interaction of Goal Time Perspective  $\times$  Group  $\times$  Marital Status reach significance.

**Between-Groups Univariate Analyses**—To further explore variations in goal time perspective between the two groups, separate ANCOVAs, covarying age and including marital status as a factor, were conducted on (a) each of the six individual goal time perspective dimensions, (b) composite goal limited time perspective score, (c) composite

<sup>2</sup>It is important to note that, likely due to restriction in the range of this variable, no differences in any time perspective dimension were observed as a function of participant age. Such differences are typically observed when comparing younger adults (typically age 18–29) and older adults (typically age 65 and over).

goal expansive time perspective score, and (d) the ratio of limited to expansive goal time perspective. Table 2 displays results for all between-groups univariate analyses. As predicted, the ratio score of limited to expansive goal time perspective was significantly higher for the metastatic cancer sample than the comparison sample (see descriptive statistics in Table 1). In addition, metastatic cancer group goals were rated significantly higher on enjoying the present, maximizing emotional satisfaction, and the composite limited time perspective score. Groups did not differ on the spending time with close others dimension. With regard to expansive time perspective goals, the groups did not differ on the composite expansive time perspective score, and planning for the future was the only individual expansive time perspective dimension for which a significant group difference emerged, with comparison group goals rated significantly higher on the future dimension than metastatic group goals.

Marital status significantly predicted goal time perspective preference in four analyses: enjoying the present, composite expansive time perspective, planning for the future, and the ratio of limited to expansive time perspective, such that goals of married women were rated significantly higher on enjoying the present and the ratio of limited to expansive time perspective, whereas goals of unmarried women were rated significantly higher on planning for the future and the composite expansive time perspective score. In no case did the Group  $\times$  Marital Status interaction reach significance.

**Within-Group Goal Preferences**—Finally, we explored within-group preferences for goal time perspective. Four repeated measures ANCOVAs, covarying age, were conducted for each group, each with a within-subjects factor of goal time perspective (present/future, emotion/knowledge, close others/distant others; total goal limited time perspective/total goal expansive time perspective) and between-subjects factor of marital status. Due to the potentially influential role of current health status in goal selection among women living with metastatic breast cancer, we first considered a number of measures of physical functioning and symptoms (i.e., SF-36 MCS, SF-36 PCS, all SF-36 subscales, number of metastatic sites, number of comorbid medical conditions, perceived illness-related stress, tumor estrogen receptor status) as potential covariates, but correlations of these variables with time perspective were largely nonsignificant.

Results of within-group analyses are displayed in Table 3. Goals reported by both groups were rated significantly higher on the composite limited time perspective score than the composite expansive time perspective score and on the emotion dimension than the knowledge dimension (see Table 1). No significant preferences were observed within either group on the present/future dimensions or on the close others/distant others dimensions.

For women in the comparison group, the Goal Time Perspective  $\times$  Marital Status interaction did not achieve significance within any model. However, among women in the metastatic group, being married was associated with higher goal scores on composite limited versus composite expansive, present versus future, and close others versus distant others (but not the emotion dimension vs. the knowledge dimension).

The possibility that there may be a trajectory of goal adjustment that takes place after a woman is diagnosed with metastatic breast cancer prompted us to test interactions between time since diagnosis of metastatic cancer and goal preferences. As displayed in Table 3, a significant interaction of Time Since Metastatic Diagnosis  $\times$  Goal Time Perspective emerged in preference for the emotion dimension relative to the knowledge dimension. To understand the shape of this interaction, we calculated estimated marginal means for the emotion and knowledge dimensions at the mean for time since metastatic diagnosis (months since metastatic diagnosis = 32.74, emotion dimension:  $M = 0.74$ ,  $SE = 0.02$ , knowledge dimension:  $M = 0.13$ ,  $SE = 0.02$ ) and at one standard deviation above the mean (months since metastatic diagnosis = 62.72, emotion dimension:  $M = 0.79$ ,  $SE = 0.03$ , knowledge dimension:  $M = 0.13$ ,  $SE = 0.02$ ) and below the mean (months since metastatic diagnosis = 3.00, emotion dimension:  $M = 0.70$ ,  $SE = 0.03$ , knowledge dimension:  $M = 0.14$ ,  $SE = 0.02$ ). As hypothesized, preference for emotion over knowledge goals increased as a function of greater time since metastatic diagnosis. No other significant interactions of goal time perspective preference with time since metastatic diagnosis emerged.

### Dot-Probe Task Analyses

**Attention reaction time:** Table 4 displays mean reaction times by group on the attention task. Following Mather and Carstensen's (2003) method, we conducted one-sample  $t$  tests within each group testing for preference to attend to neutral versus emotional faces in positive/neutral face pairs and in negative/neutral face pairs. Post hoc sensitivity power analysis indicated that we had .80 power to detect a small to medium effect in both groups (specifically,  $d = 0.31$  in the metastatic group,  $d = 0.41$  in the comparison group). No  $t$  test was significant at  $p < .05$  and, in light of these null results, we were prompted to compute JZS Bayes factors ( $B_{01}$ ; Rouder, Speckman, Sun, Morey, & Iverson, 2009) for each test.<sup>3</sup> Specifically, the data suggested that neither group demonstrated a significant attentional preference on either positive/neutral trials—metastatic group,  $M = -4.09$ ,  $SD = 23.62$ ,  $SE = 2.56$ ,  $t(84) = -1.60$ ,  $p = .115$ ,  $d = 0.17$ ,  $B_{01} = 1.85$ ; comparison group,  $M = -5.04$ ,  $SD = 23.58$ ,  $SE = 3.37$ ,  $t(48) = -1.50$ ,  $p = .141$ ,  $d = 0.21$ ,  $B_{01} = 1.75$ —or negative/neutral trials, metastatic group,  $M = 4.12$ ,  $SD = 19.85$ ,  $SE = 2.15$ ,  $t(84) = 1.92$ ,  $p = .059$ ,  $d = 0.21$ ,  $B_{01} = 1.11$ ; comparison group,  $M = -0.80$ ,  $SD = 18.74$ ,  $SE = 2.68$ ,  $t(48) = -0.30$ ,  $p = .766$ ,  $d = 0.04$ ,  $B_{01} = 4.52$ . Group comparisons on positive and negative bias scores were also null: positive bias scores,  $F(1, 132) = 0.05$ ,  $p = .821$ ,  $\eta_p^2 = .00$ ,  $B_{01} = 3.79$ ; negative bias scores,  $F(1, 132) = 1.99$ ,  $p = .161$ ,  $\eta_p^2 = .02$ ,  $B_{01} = 1.68$ . Post hoc sensitivity power analysis indicated that we had .80 power to detect medium effects (specifically,  $\eta_p^2 = .06$ ) in this analysis. Rouder et al. (2009) suggest that Bayes factor values over 3 offer “some evidence,” values over 10 offer “strong evidence,” and values over 30 offer “very strong evidence.” All Bayes factors favored the null hypothesis, however, according to these guidelines, the results provide minimal evidence in favor of the null on both negative versus neutral and positive versus neutral trials within the metastatic group and on positive versus neutral trials within the comparison group. Bayes factor values above 3 on negative versus neutral trials within the comparison group and on both between-groups comparisons provide “some evidence” in

<sup>3</sup>We thank the editor for this suggestion to include JZS Bayes factors.

favor of the null. In short, the data did not reveal compelling support in favor of either the a priori or null hypotheses.

**Recognition memory accuracy:** Mean recognition accuracy (see Table 5) across groups and conditions was somewhat lower ( $M = 0.28$ ) than that in Mather and Carstensen (2003) ( $M = 0.41$ ). Accuracy scores were submitted to a repeated-measures ANCOVA with between-subjects factors of group (metastatic, comparison) and marital status and within-subjects factors of valence at encoding (positive, negative) and test version (emotional, neutral). Post hoc sensitivity power analysis indicated that we had .80 power to detect small effects ( $\eta_p^2 = .02$ ). Age and marital status did not interact with group in predicting accuracy and were included as covariates. Consistent with hypothesis, we observed a main effect of valence,  $F(1, 118) = 5.26, p = .024, \eta_p^2 = .04$ , such that across groups, participants demonstrated better accuracy for faces initially presented in positive/neutral face pairs ( $M = 0.31, SE = 0.03$ ) relative to faces initially presented in negative/neutral face pairs ( $M = 0.25, SE = 0.02$ ), regardless of whether the face was presented at test in its emotional or neutral form. However, we did not observe the predicted Valence  $\times$  Test Version  $\times$  Group interaction,  $F(1, 118) = 0.25, p = .615, \eta_p^2 = .00$ . No other significant effects were found.

**Recognition response time:** Following Mather and Carstensen (2003), we conducted an analysis of recognition response times, transformed with a natural logarithm because they were not normally distributed. The transformed RTs were submitted to a repeated-measures ANCOVA with between-subjects factors of group (metastatic, comparison) and marital status (married, unmarried) and three within-subjects factors of valence at encoding (positive, negative), face version at test (neutral, emotional), and trial type (target, distracter). (Residual values of this analysis were normally distributed; for ease of interpretation, we have reported estimated marginal means on raw rather than transformed values.) Preliminary analyses indicated that depressive symptoms, physical health, marital status, and age did not interact with group in predicting RT and these variables were included as covariates. Post hoc sensitivity power analysis indicated .80 power to detect small effects (specifically,  $\eta_p^2 = .01$ ).

The data revealed a trend for a main effect of valence,  $F(1, 118) = 3.65, p = .058, \eta_p^2 = .03$ , such that across groups women responded more slowly to faces previously seen as positive ( $M = 1,274.92, SE = 21.87$ ) than negative ( $M = 1,262.93, SE = 19.88$ ). This effect was qualified by a Valence  $\times$  Age interaction,  $F(1, 118) = 5.85, p = .017, \eta_p^2 = .05$ , such that it was reversed among younger women (age = 46.72, positive trial RT:  $M = 1,209.71, SE = 27.40$ ; negative trial RT:  $M = 1,223.92, SE = 24.91$ ; age = 57.46, positive trial RT:  $M = 1,285.79, SE = 22.26$ ; negative trial RT:  $M = 1,269.43, SE = 20.23$ ); age = 68.20, positive trial RT:  $M = 1,361.87, SE = 33.38$ ; negative trial RT:  $M = 1,314.95, SE = 30.34$ ). No other interactions with valence were observed.

**Post hoc analyses: Goal time perspective scores predicting valence bias:** To explore the cognitive bias data in more depth, we conducted between-groups and within-group analyses using goal limited time perspective scores, goal expansive time perspective scores, and the

ratio of goal limited time perspective to expansive time perspective scores as predictors of valence bias in attention and recognition for emotional faces. The only significant effects were observed for negative attentional bias. Negative attentional bias was regressed on group (metastatic, comparison), goal time perspective, and the interaction of Group  $\times$  Goal Time Perspective (three separate parallel analyses were conducted with the three respective goal time perspective scores as predictors). Post hoc sensitivity power analysis indicated .80 power to detect small to medium interaction effects (specifically,  $\eta_p^2 = .06$ ). The Group  $\times$  Goal Time Perspective interaction was significant for the ratio of goal limited time perspective to expansive time perspective ( $\beta = 0.66, p = .026; R^2 = .04$ ), and goal limited time perspective ( $\beta = 0.74, p = .014; R^2 = .05$ ), and there was a trend for goal expansive time perspective ( $\beta = -0.48, p = .073; R^2 = .02$ ). Within the comparison group, the ratio of goal limited to expansive time perspective was associated with greater negative bias ( $\beta = 0.29, p = .041; R^2 = .09$ ) whereas goal expansive time perspective was associated with lower negative bias ( $\beta = -0.32, p = .024; R^2 = .10$ ); there was a trend for goal limited time perspective to be associated with greater negative bias ( $\beta = 0.24, p = .092; R^2 = .06$ ). Post hoc sensitivity power analysis indicated .80 power to detect medium effects (specifically,  $\eta_p^2 = .14$ ). There was a trend among the metastatic group for goal limited time perspective to be associated with *lower* negative bias ( $\beta = -0.20, p = .068; R^2 = .04$ ), but the effects for goal expansive time perspective ( $\beta = -0.01, p = .910; R^2 = .00$ ) and the ratio score ( $\beta = -0.13, p = .248; R^2 = .02$ ) were null. Post hoc sensitivity power analysis indicated .80 power to detect small to medium effects (specifically,  $\eta_p^2 = .08$ ).

### Summary of Study 1 Results

We undertook Study 1 to investigate whether goal preferences and biases in attention and memory in women living with metastatic breast cancer relative to similarly aged women without a cancer diagnosis varied systematically as SST predicts they might. Overall, findings from the life goals analyses were largely consistent with hypotheses. Specifically, although both groups demonstrated an overall preference for limited over expansive time perspective goals, results were largely consistent with the hypothesis that metastatic group goals were weighted more heavily toward limited time perspective than comparison group goals. Furthermore, married women in both groups also demonstrated this preference. In contrast, findings from the dot-probe task did not support our hypotheses; however, post hoc analyses revealed associations between goal time perspective scores and a negative attentional bias. Specifically, among the comparison sample, goal expansive time perspective was associated with lower negative bias, whereas the ratio of goal limited to expansive time perspective was associated with higher negative bias. In contrast, the metastatic group did not demonstrate this pattern and there was a trend for goal limited time perspective to be associated with lower negative bias. In Study 2, we examined whether this relative emphasis on limited versus expansive time perspective goals predicted psychological adjustment across time among women with metastatic breast cancer.



## Study 2

According to SST, observed differences in goal preferences across the life span encourage humans to approach activities that aid them in deriving benefit from the remainder of their lives (Carstensen et al., 1999). For those with expansive time perspective, the pursuit of goals related to knowledge acquisition is logical and adaptive, as those individuals are looking toward long futures during which acquired knowledge may prove useful. Conversely, for individuals who perceive time as more limited, new knowledge does not hold the same value as there may be little time in which to make use of it. Hence, consistent with Study 1 findings, these individuals are more likely to pursue goals that are immediately emotionally rewarding.

This attention to the present moment and associated focus on emotionally meaningful goals may contribute to fortuitous mental health outcomes in one group of people who theoretically perceive time as limited: older adults display lower rates of all major nondementia related psychiatric illnesses than do younger adults (Regier et al., 1988). Furthermore, the results of an experience-sampling study in a nonclinical sample of older and younger adults indicate that older adults experience negative emotions less frequently (Carstensen, Pasupathi, Mayr, & Nesselroade, 2000). Moreover, Carstensen et al. found that when older adults did report experiencing a negative emotion, they were less likely than younger adults to report that they were still experiencing that emotion at the next sampling point, suggesting that older adults may be better able to regulate negative emotions when they arise. Thus, it appears that the perception of limited time may carry beneficial emotional correlates for some groups of individuals living under the auspices of limited time. Yet, other explanations for these findings are possible. Specifically, distinguishing between the effects of advanced age and limited time perspective by using samples of older and younger adults is difficult as chronological age and time perspective are inherently confounded. Therefore, in Study 2 we sought to understand the interplay between limited time perspective goals and psychological adjustment in the same group of diversely aged women living with metastatic breast cancer we examined in Study 1. This particular sample provides an opportunity to examine how adopting goals associated with limited time perspective may facilitate adjustment to this challenging life event.

A diagnosis of metastatic breast cancer carries with it a unique set of potential stressors. Living with metastatic disease often means adjusting to arduous medical treatments, accepting that total eradication of the cancer is unlikely, and confronting fears regarding the end of life. In light of these extraordinary challenges, it is not surprising that one study found that 31% of women with metastatic breast cancer met diagnostic criteria for a mood disorder (Kissane et al., 2004). In addition, standard periodic tests to monitor disease progression and treatment effectiveness engender anxiety in many living with advanced cancer (Murray et al., 2002). Thus, living with advanced cancer entails a host of challenges to healthy psychological functioning.

What variables predict positive psychological adjustment to living with metastatic breast cancer? To generate hypotheses regarding this question, we looked again to SST and argue that when confronted with a diagnosis of metastatic cancer, women, whether age 42 or 72,

are likely living with the perception of limited time remaining in life and therefore may benefit psychologically from focusing on goals theoretically associated with limited time perspective. There is already evidence that some women with metastatic cancer find living “one day at a time” and fostering short-term goals—both pursuits that are theoretically linked with limited time perspective and empirically linked to older adult preferences—to be useful coping strategies (Clayton, Butow, Arnold, & Tattersall, 2005). The Fung and Carstensen (2006) study suggests that in the context of a large-scale event that theoretically limits time perspective on a short-term basis (the SARS epidemic), a focus on intimate social partners (a motivational frame theoretically linked to limited time perspective) may not facilitate optimal emotion regulation among younger adults. However, living with metastatic breast cancer is a markedly different experience from living with the short-term and abstract fear that one *might* contract an infection and die quickly. Women with metastatic cancer are already living with a disease that is chronic and with the knowledge that it will likely end their lives, but not typically within a matter of weeks (note that all women in our study had a physician-estimated survival time of at least six months). Hence, we aligned our hypotheses with the notion that shifting goals in accordance with time perspective may be helpful for a person of any age confronting the end of life.

We predicted that the extent to which women endorsed goals characteristic of older adults (i.e., goals related to emotions) would predict positive psychological adjustment over the course of the 3-month study as measured by a decline in intrusive thoughts about cancer and increased perceived cancer-related benefits. Conversely, we hypothesized that the degree to which women endorsed goals characteristic of younger adults (i.e., goals related to knowledge) would predict poorer psychological adjustment. Although there is nothing inherently “harmful” about expansive time perspective goals, we reasoned that, in this particular context of life-limiting illness, a focus on future-oriented goals might impede psychological adjustment (specifically perceived posttraumatic growth) by drawing attention and energy away from prioritization of goals that optimize emotion regulation in the present. These hypotheses were tested in the same sample of women living with metastatic breast cancer as described in Study 1. At study entry (Time 1; T1), participants completed an interview assessing life goals and questionnaires assessing psychological adjustment. At a 3-month follow-up assessment (Time 2; T2), participants completed a similar questionnaire set.

## Method

**Participants**—Of the 113 participants who provided data on life goals, two died between T1 and T2, and 10 participants did not complete the T2 assessment, either because they declined or could not be contacted. These participants were excluded along with participants ( $n = 10$ ) who did not provide data required for analyses (e.g., they did not provide information on time elapsed since metastatic diagnosis), leaving 91 participants for whom prospective analyses were possible. Participants received \$25.00 for completion of the T2 assessment.

**Procedure**—At 3 months after the interview, participants were contacted by phone and mailed a second questionnaire packet, which they returned by mail.

## Measures

**Goal time perspective:** Coded strivings from Study 1 were used as predictors of cancer-specific adjustment in Study 2. To minimize the number of tests performed, we investigated only the composite limited and expansive time perspective goal scores and the ratio of limited to expansive time perspective goal score as potential predictors of psychological adjustment.

**Adjustment to living with metastatic breast cancer:** Women completed one measure of cancer-specific distress and one measure of perceived cancer-related benefits. At T1 and T2, distress was assessed using the Intrusion subscale of the Impact of Event Scale (IES; Horowitz, Wilner, & Alvarez, 1979). Participants responded to the items “with regard to your experience with cancer.” The 7-item Intrusion subscale of the IES is a psychometrically sound measure of the degree to which a traumatic event invades cognition and arouses event-related negative emotion. Internal consistency in the current study was T1  $\alpha = .82$ , and T2  $\alpha = .87$ .

Tedeschi and Calhoun’s (1996) Posttraumatic Growth Inventory (PTGI) was used to measure perceived cancer-related growth in five domains: relating to others, new possibilities, spirituality, personal strength, and appreciating life. To minimize the number of tests conducted, we examined the total score. The 21-item scale has been used extensively in cancer research and demonstrated high internal consistency in present research (T1  $\alpha = .94$ , T2  $\alpha = .96$ ).

## Results

**Inclusion of Covariates**—Preliminary analyses revealed only one interaction between any covariate (age, years of education, time since metastatic diagnosis, number of chronic comorbid medical conditions, marital status) and goal time perspective (limited, expansive, and ratio of limited to expansive time perspective) on either outcome variable. The sole significant interaction was observed between marital status and goal limited time perspective on IES Intrusion. In light of this significant interaction and the potentially important role that a woman’s marital status might play in her selection of goals (particularly social goals) and their influence on adjustment, we included the Marital Status  $\times$  Goal Limited Time Perspective in IES Intrusion analyses. As our hypotheses concerned effects of goal time perspective and not chronological age, age was controlled. Time between diagnosis of metastatic disease and study entry was controlled in analyses because of the large range observed in our sample (minimum = 1 month, maximum = 126 months) and the theoretical notion that the longer a woman lives with metastatic breast cancer, the greater the length of time she has had to adjust to living with the disease and to alter her goals accordingly. Number of chronic comorbid medical conditions and years of education were included in all models because significant correlations were observed among these variables and outcome variables. Correlations of years of education with T2 IES Intrusion and T2 PTGI scores were  $r = .26$ ,  $p = .014$  and  $r = -.11$ ,  $p = .322$ , respectively; correlations with number of chronic comorbid medical conditions were  $r = -.21$ ,  $p = .042$ , for T2 IES Intrusion and  $r = -.26$ ,  $p = .012$ , for T2 PTGI. Finally, study entry scores on dependent variables were controlled in analyses to allow examination of predictors of change in dependent variables over time.

**Descriptive Statistics on Study Variables**—Scores on predictor variables among the subgroup included in prospective analyses did not differ significantly from those of the total sample (see Table 1). Scores on the IES Intrusion were lower than those reported by Butler, Koopman, Classen, and Spiegel (1999) in a sample of metastatic breast cancer patients ( $M = 16.50$ ). Participants reported levels of cancer-related benefits that were comparable to those reported by a sample of women who had been diagnosed with Stage 0-III B (80% Stage I or Stage II) breast cancer during the previous five years (PTGI:  $M = 64.10$ ,  $SD = 24.80$ ) (Cordova, Cunningham, Carlson, & Andrykowski, 2001). Paired-sample  $t$  tests on dependent variables at T1 and T2 indicated that dependent variables were relatively stable over the 3-month study: IES Intrusion, T1  $M = 10.08$ ,  $SD = 7.50$ ; T2  $M = 9.81$ ,  $SD = 8.04$ ;  $t(90) = 0.41$ ,  $p = .685$ ,  $d = 0.04$ ; PTGI, T1  $M = 64.75$ ,  $SD = 22.60$ ; T2  $M = 63.57$ ,  $SD = 24.68$ ;  $t(90) = 0.71$ ,  $p = .482$ ,  $d = 0.12$ . Zero-order correlations among predictor variables and PTGI and IES scores at T1 and T2 were nonsignificant.

**Psychological Adjustment Predicted by Goal Time Perspective**—To test the hypotheses that whereas both goal limited time perspective and the ratio of goal limited to expansive time perspective would predict better psychological adjustment and goal expansive time perspective would predict poorer adjustment, we conducted hierarchical multiple regression analyses using goal time perspective scores as predictors of T2 PTGI and IES Intrusion scores. Age, years of education, number of chronic comorbid medical conditions, and T1 scores on the relevant dependent variable were controlled. In addition, marital status was included as a covariate in PTGI analyses and treated as a potential moderator in IES Intrusion analyses. All predictors were centered prior to being entered in the model.

**Posttraumatic Growth Inventory Predicted by Goal Time Perspective**—T2 PTGI scores were regressed separately on goal limited time perspective, the ratio of goal limited to expansive time perspective, and goal expansive time perspective (see Table 6). Consistent with hypothesis, after controlling for the relevant dependent variable at study entry, age, time since metastatic diagnosis, number of comorbid medical conditions, years of education, and marital status, goal expansive time perspective predicted significantly decreased PTGI scores over 3 months ( $\beta = -0.17$ ,  $p = .013$ ;  $R^2 = .03$ ). No significant effects were observed on PTGI for goal limited time perspective or for the ratio of goal limited to expansive time perspective.

**Impact of Event Scale Intrusion Predicted by Goal Time Perspective**—As shown in Table 7, the same covariates were included in the three IES Intrusion models as were included in the PTGI models, with the exception that marital status was considered as a moderating variable. Goal limited time perspective predicted increased intrusive thoughts about cancer over time, but it was not associated with a statistically significant change in explained variance ( $\beta = 0.61$ ,  $p = .006$ ;  $R^2 = .02$ ,  $p = .089$ ). It is important to note that this effect was qualified by a Marital Status  $\times$  Goal Time Perspective interaction ( $\beta = -0.81$ ,  $p < .001$ ;  $R^2 = .06$ ,  $p < .001$ ). To explore the shape of this interaction, we conducted separate regressions, including relevant covariates, of IES Intrusion on goal limited time perspective within unmarried ( $n = 31$ ) and married ( $n = 60$ ) women. Among married women, there was

no significant effect of goal limited time perspective on IES Intrusion scores ( $\beta = .08, p = .371, R^2 = .01$ ). Among unmarried women, goal limited time perspective was a significant predictor of decreased IES Intrusion scores at follow-up ( $\beta = -0.52, p = .001; R^2 = .19$ ). As shown in Study 1, unmarried women demonstrated lower preference for limited time perspective goals than married women. No significant effects on IES Intrusion emerged for the ratio of goal limited to expansive time perspective or for goal expansive time perspective.

### Summary of Study 2 Results

Consistent with hypothesis, goal expansive time perspective scores predicted a significant decline in perceived benefits related to cancer. Among unmarried women, goal limited time perspective scores predicted a significant decline in cancer-related intrusive thoughts and feelings. Contrary to hypothesis, limited time perspective goals were not significantly associated with change in PTGI scores, expansive time perspective goals were not significantly associated with change in IES Intrusion scores, and the ratio of limited to expansive time perspective goals was not associated with change in either IES Intrusion or PTGI scores.

### General Discussion

The current research was designed to examine how the tenets of SST map onto diversely aged women confronting limited time perspective as a result of a medical diagnosis as opposed to the natural aging process. The data largely supported our hypotheses with regard to differences in life goals between women living with metastatic disease and comparison women and, within the metastatic group, the salutary effects for psychological adjustment of focusing on limited versus expansive time perspective goals. Thus, data from these studies offer some evidence in support of the notion that individuals select life goals according to similar time perspective “rules” regardless of whether limited time perspective arises over the span of a lifetime or more abruptly because of a medical diagnosis. Further, the data suggest that this selective attitude facilitates psychological health in women who have met with medically constrained futures, regardless of chronological age. In contrast, the predicted differences between the metastatic and comparison group did not emerge when considering biases in attention and memory for emotional faces. However, post hoc analyses on the dot-probe task revealed that life goals from Study 1 differentially predicted negative attentional bias between the two groups.

The pattern of Study 2 findings suggests that although limited time perspective goals may protect against distress, they do not appear to promote psychological growth and that although expansive time perspective goals may detract from positive growth, they do not contribute to distress. Although the interpretation of null findings must be cautious, it is possible that within the realm of psychological adjustment, it may be most accurate to conceptualize limited and expansive time perspective goals as independent dimensions of time perspective that act on a two-dimensional space of positive psychological adjustment and psychological distress. Why might limited and expansive time perspective goals selectively influence positive psychological adjustment and distress? The aging literature offers a compelling explanation regarding a selective influence of limited time perspective:

Previous research has suggested that the emotional benefits of limited time perspective in older adults may work more effectively to reduce psychological distress than to augment positive emotion. In their daily experiencing sampling study, Carstensen et al. (2000) found that although older and younger adults experienced positive emotions at the same frequency over the course of the day, older adults experienced negative emotions at a significantly lower rate, suggesting that the emotional aegis of limited time perspective may work through a reduction in negative affect as opposed to an increase in positive affect. We might therefore expect that limited time perspective goals would be associated more strongly and negatively with measures of distress, such as intrusive thoughts about cancer, than with measures of psychological health, such as perceived cancer-related benefits. Indeed, Carstensen et al. (1999) note that limited time perspective may serve to protect older adults from mood disorders because anxiety often arises out of concerns regarding the future, concerns which are frequently paramount for women living with metastatic cancer. Hence, focusing on the present moment may alleviate some of these future-related anxieties, thereby bolstering mental health. This line of reasoning introduces questions regarding the mechanisms through which time perspective acts to influence psychological well-being. Simply reallocating attention away from anxiety-provoking stimuli is one possibility; more explicitly reallocating resources away from the pursuit of goals that are no longer adaptive is another potential pathway.

The notion that goal flexibility bears on psychological health is consistent with an extensive body of previous research on goal adjustment in individuals facing different forms of health-related adversity (Rasmussen, Wrosch, Scheier, & Carver, 2006; Schmitz, Saile, & Nilges, 1996; Wrosch, Bauer, & Scheier, 2005; Wrosch, Scheier, Miller, Schulz, & Carver, 2003). This work suggests that both the ability to disengage from goals that are no longer attainable as well as the ability to reengage with new goals that are attainable promotes quality of life (e.g., Thompson, Stanton, & Bower, 2013; Wrosch et al., 2003). Thus, one possibility is that goal attainability may mediate the relationship between time perspective and psychological adjustment. SST contends that for individuals living with limited time, goals aimed at maximizing emotional satisfaction are adaptive because their value is most often realized in the present rather than a future point in time that these individuals may not live to enjoy. Future research will be necessary to test more directly whether adjusting one's time perspective according to one's health status facilitates the selection of attainable goals.

Findings also point to the importance of social context, specifically marital status, in goal selection and psychological adjustment. Marital status emerged as a significant predictor of goal preferences and also modified the effect of limited time perspective goals on psychological adjustment over time. The meaning of a diagnosis of life-limiting illness may differ between women who are married and those who are not, insofar as the life that women are contemplating leaving behind differs between these groups. One potential interpretation of these simultaneous, unique effects of group (metastatic vs. comparison) and marital status on goal selection is that, in response to diagnosis of a life-limiting medical illness, married women are predisposed to assume a limited time perspective motivational framework, but that the effects of the diagnosis on goal selection transcend marital status as well. Though such a conclusion is purely speculative, findings highlight the importance of investigating what factors determine the goodness of fit between the limited time perspective motivational

framework and any individual person (married or unmarried). Factors to examine in future research include the availability of resources necessary for functioning adaptively within this framework, such as access to intimate social partners (whether spouses, children, grandchildren, siblings, other family, or close friends) and access to and continued ability to participate in emotionally meaningful activities.

Although we did not expect to observe a preference for limited time perspective goals as a function of marital status, from a goal-attainability standpoint it is not surprising that, across both groups, married women would demonstrate preference for goals related to limited versus expansive time perspective. Married women likely have more access, on average, to a close social partner, thereby making limited time perspective goals more easily attainable. However, curiously, within the metastatic group, the effect of limited time perspective in predicting decreased intrusive thoughts about cancer was significant only among *unmarried* women. The current study does not offer any data that speak to this question directly, but we might speculate that the absence of a partner whose support might be, in many cases, relatively more automatic than that of other family and friends, may necessitate explicit focus on limited time perspective goals to garner adequate social support to protect against distress. Future research should explore this potential mediating role of social support between limited time perspective goals and decreased intrusive thoughts, as well as the potential moderating role of marital satisfaction in the relationship between marital status and preference for limited time perspective goals.

Limited time perspective goals may often be more easily attained than expansive time perspective goals in the context of metastatic breast cancer, but not all expansive time perspective goals are unattainable. Indeed, the effects of expansive time perspective goals on adjustment emerged only as an attenuation in perceived cancer-related benefits and not as an augmentation of distress. It is plausible that many goals that would be rated highly on expansive time perspective according to our coding scheme (e.g., “join a Spanish class”) may remain meaningful and attainable for some women living with metastatic disease. Fortuitously then, pursuit of these goals may not be harmful but may simply reduce or delay growth that might take place if goal selection were to align more with SST-conceived limited time perspective.

It is also interesting that when looking at individual dimensions of time perspective, differences between the metastatic group and the comparison group were more prevalent on dimensions of limited than expansive time perspective, suggesting that perhaps shifts in time perspective that take place suddenly and, in some cases, at a nonnormative age, may result in greater emphasis on limited time perspective goals but not necessarily lesser emphasis on expansive time perspective goals. Yet, although expansive time perspective itself was not implicated in psychological distress in this study, given that coping with a chronic illness consumes time and psychological resources, it seems potentially problematic to suggest that people living with life-limiting conditions would benefit from finding additional time and energy to devote to limited time perspective goals without reducing time and energy devoted to other goals. One interpretation of these findings that warrants further investigation is that the greatest psychological benefit is derived from a thoughtful winnowing of goals, such that emphasis shifts to limited time perspective goals, but meaningful and attainable expansive

time perspective goals remain within an individual's purview. Indeed, women in the metastatic cancer group reported on average fewer goals ( $M = 6.52$ ) than women in the comparison group ( $M = 8.92$ ). This finding may reflect both that any kind of goal is inherently future-oriented and, simultaneously, that women living with metastatic disease are selectively allocating their resources to those goals that are most important to them. SST argues, and findings from Study 1 suggest, that this selection naturally results in greater emphasis on limited time perspective goals but not necessarily to the exclusion of all expansive time perspective goals.

Why might goal-preference results align with SST predictions while biases in attention and memory for emotional faces do not? Three classes of explanations emerge: the first points to limitations of the study design, the second to potential specificity of circumstances under which the positivity bias emerges, and the third to the application of SST in this particular population where limited time perspective has arrived suddenly and brought with it a host of challenges not typically found in healthy older adults. With regard to study design limitations, metastatic breast cancer is quite rare in young adults, and our age matching precluded examining a young adult comparison group. Despite this lack of comparison to a true younger group, however, the fact remains that the metastatic group did not demonstrate a bias toward positive emotional faces and away from negative faces. This absence of a positivity bias in the metastatic group could be due to an unintentional priming of negative affect that temporarily eliminated an existing positivity bias: women completed the task following an interview regarding the effect of the diagnosis on their lives, which generated negative emotions for many women. Furthermore, the mean CES-D score in the metastatic sample ( $M = 14.44$ ) was higher than that typically observed in middle-aged women ( $M = 8.73$  for women ages 50–59 and  $M = 7.83$  for women ages 60–69; Lewinsohn, Seeley, Roberts, & Allen, 1997), and it may be that the cognitive bias imparted by depressed mood simply overpowered a potential positivity bias imparted by limited time perspective.

Alternatively, it may be that a positivity bias could be elicited with different task demands in women living with metastatic breast cancer. There is evidence that the positivity bias typically observed in older adults demonstrates flexibility in that it can be “erased” by taxing cognitive resources (e.g., divided attention) and with experimental instruction (e.g., instruction to focus on accurately recalling events) and that it can be induced in younger adults by instruction to focus on emotional states in recall (Kennedy et al., 2004; Knight et al., 2007). Thus, the positivity effect is not omnipresent in older adults and the fact that it did not appear in this study does not necessarily mean that it is entirely absent in women living with metastatic breast cancer. However, for some women it may be that the emotional demands associated with living with the disease place them in a state where cognitive resources are continuously taxed, thereby eliminating a positivity bias that might otherwise be present. It is also possible that the explicit knowledge that time is limited and subsequent selective attention on consciously chosen life goals requires time to “trickle down” to lower level and less explicit cognitive processing.

Finally, it may be the case that some sequelae of medically induced limited time perspective simply do not map perfectly onto all SST predictions. One possibility, as Labouvie-Vief (2003) speculates, is that the emergence of the positivity effect hinges more on a



maturational process, whether organic and/or developmental, than on perceptions of probable time remaining in life. Alternatively, the absence of the positivity bias in the current sample may reflect characteristics of the specific context that women with metastatic cancer confront. A diagnosis of metastatic breast cancer is relatively sudden, often occurs at a nonnormative point in the life span, and typically involves coping with bothersome symptoms. Doubtless then, the experience of limited time perspective for a 42-year-old woman with young children who receives a diagnosis of metastatic breast cancer and confronts daily reminders of it in the form of symptoms and side effects will be different in at least some ways—likely more complex and colored with negative emotion—from that of a 72-year-old woman who is in good health, has adult children and lives with the real but abstract knowledge that time is more limited now than when she was younger. Wurm, Tomasik, and Tesch-Römer (2008) have offered empirical support for the notion that off-time health events generate greater psychological distress than similar events occurring with more typical placement in the life span. In a large prospective study, they found that a serious health event in middle age resulted in greater reductions in self-reported subjective health and life satisfaction than similar events in the elderly. Thus, there is both theoretical and empirical support for the notion that positivity may not always result when individuals confront limited time in the context of significant medical diagnoses.

Although the predicted main effect of a positivity bias among the metastatic group did not emerge, there was a significant difference between groups regarding the association of life goals and negative attentional bias. Although the groups of women in the current study were of approximately the same chronological age, the nature of their life goals differentially influenced their attention toward negative emotional stimuli. The ratio of limited to expansive time perspective goals among the comparison group was linked to a focus on negative emotional stimuli. This finding is theoretically consistent with Fung and Carstensen's (2006) observation of smaller reductions in distress over time among younger adult participants who selected the limited time perspective social partner option during the SARS epidemic. Thus, the current data represent nascent evidence that limited time perspective goals may only nurture a focus away from negative emotional stimuli among those actually nearing the end of life and that such a focus may actually turn those not in that situation *toward* negative emotional information. It goes without saying that the relations among age, time perspective, health status, life goals, attentional biases, and psychological adjustment are complex. Future research will benefit from unfolding the layers of this complexity via careful consideration of the situations in which and persons for whom we expect limited time perspective, and its psychological correlates observed in older adults, to function in the service of psychological adjustment.

Despite the complexity of the findings reported here, it is possible that the salutary effects of limited time perspective goals in the context of a life-limiting medical condition on psychological adjustment have potential clinical implications. Specifically, it may be useful to explore the possibility of developing psychosocial interventions aimed at helping individuals who face medically imposed limited time perspective to select goals accordingly, focusing on limited time perspective goals but not to the exclusion of all expansive time perspective goals. Although it may at first seem counterintuitive to focus a group of individuals already at increased risk for mood disorders on the idea that their disease will

likely limit their remaining time in life, it is important to underscore that a focus on limited time perspective is markedly different from a focus on death. Fostering goals associated with limited time perspective involves participating in activities that are emotionally meaningful in the present moment—not ruminating on a future that may or may not arrive—and selecting goals that are appropriate based on an estimation of time left in life that accounts for not only chronological age but also other pertinent factors, such as health status. According to SST, in fact, such unhelpful future-focused ruminations are characteristic of expansive, not limited, time perspective.

Although the prospective design of Study 2, with statistical control for initial values on dependent variables, allows for cautious causal inference regarding the effects of goal time perspective on adjustment, the correlational design limits the conclusions that can be drawn regarding the unique effects of goal time perspective on psychological well-being. Thus, third variable explanations remain possible. To isolate the unique effect of time perspective on goal selection, it will be necessary to conduct experimental research in which time perspective is manipulated along with other associated variables, such as health-related life disruption.

Limitations of these studies include the relatively small sample size and the homogeneity of the samples in terms of participant sex, ethnicity, and socioeconomic status. Future research should explore whether observed effects hold for both men and women of diverse backgrounds facing different life-limiting conditions. Furthermore the time frame of this prospective study was relatively short (3 months), there were no significant changes in mean dependent variable scores over time, and only a few women had been recently diagnosed with metastatic disease. Whereas one might expect to observe goals to be somewhat less oriented toward limited time perspective in a group of more recently diagnosed women relative to the current sample, the salutary effects of limited time perspective might be more pronounced in women who are just beginning to grapple with the challenges of the diagnosis. Conversely, the auspices of limited time perspective goals may deepen over time as women integrate the meaning of the diagnosis into their lifestyle, beliefs, and understanding of the world. Longer follow-up might also reveal larger changes in dependent variables and would allow for the opportunity to administer the Strivings List at more than one time point to assess potential within-person changes in goal time perspective across time.

Despite these limitations, the current research offers further support for the hypothesis that individuals select goals with sensitivity to time perspective as opposed to/in addition to sensitivity to chronological age and preliminary evidence that this motivated selection supports psychological adjustment in women living with metastatic breast cancer. Further investigations of time perspective, goals, and psychological adjustment in populations confronting nonnormatively occurring limited time perspective should address potential moderators of the effects observed in the current study, including those evaluated in the current study, chronological age and time since diagnosis, and others. Although the data revealed only one significant Time Perspective  $\times$  Time Since Metastatic Diagnosis interaction (viz., women who had been living with the disease longer focused more on goals related to maximizing emotional satisfaction relative to goals related to acquiring

knowledge), it seems probable that there is a trajectory of change in time perspective following diagnosis with a life-limiting disease and that there is variation in the rate and magnitude of change in goal time perspective, which may be contingent upon a number of factors, including chronological age, social support, and preexisting psychological resources (e.g., openness, cognitive flexibility).

In summary, the current studies tested theoretical predictions from the aging literature in a group of diversely aged women confronting a life-limiting chronic illness and a comparison group of similarly aged women without a cancer diagnosis. Findings with regard to life goals largely supported the theory and suggest that goal time perspective does influence psychological adjustment in one group facing stressful health circumstances near the end of life, but did not support theory-generated predictions regarding biases in attention and memory for positive and negative emotional stimuli. Further examination of SST in populations of individuals coping with limited time perspective that has arisen primarily out of physical illness, as opposed to normal aging, offers both the opportunity to widen the base of support for the theory as well as to understand how shifts in time perspective may facilitate psychological adjustment to challenging life events.

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**Table 1**  
Descriptive Statistics by Group for Demographic Variables and Goal Time Perspective Scores

Variable	Metastatic group			Comparison group		
	n	M	SD	n	M	SD
Age	109	57.46	10.74	50	53.12	11.59
Income	82	\$84,600	\$56,700	37	\$96,700	\$179,300
Years of education	108	15.74	2.96	46	16.28	3.49
Number of goals	113	6.52	2.78	50	8.92	4.58
CES-D	111	14.44	9.80	50	10.84	9.69
SF-36 PCS	113	55.40	21.41	50	73.55	23.43
Months since diagnosis of metastatic disease	111	32.86	29.86			
Goal limited time perspective	113	1.85	0.48	50	1.47	0.49
Enjoying the present	113	0.78	0.18	50	0.61	0.19
Maximizing emotional satisfaction	113	0.76	0.19	50	0.62	0.21
Spending time with close others	113	0.32	0.21	50	0.24	0.16
Goal expansive time perspective	113	0.65	0.28	50	0.69	0.21
Planning for the future	113	0.32	0.20	50	0.42	0.19
Acquiring knowledge	113	0.14	0.15	50	0.10	0.08
Spending time with more distant others	113	0.19	0.21	50	0.16	0.14
Ratio of goal limited to expansive time perspective	113	0.74	0.11	50	0.67	0.13

Note. CES-D = Center for Epidemiologic Studies Depression Scale; SF-36 PCS = Short-Form Health Survey Physical Component Summary.

Table 2

Between-Groups Univariate Analyses on Goal Time Perspective Preferences

Outcome variable	Group			Marital status		
	df	F	$\eta_p^2$	df	F	$\eta_p^2$
Goal limited time perspective	1,152	15.24***	.09	1,152	2.58	.02
Enjoying the present	1,152	18.17***	.11	1,152	4.20*	.03
Maximizing emotional satisfaction	1,152	13.11***	.08	1,152	0.62	.00
Spending time with close others	1,152	3.28	.02	1,152	1.43	.01
Goal expansive time perspective	1,152	0.10	.00	1,152	5.77*	.04
Planning for the future	1,152	5.85*	.04	1,152	4.56*	.03
Acquiring knowledge	1,152	1.95	.01	1,152	0.15	.00
Spending time with more distant others	1,152	1.40	.01	1,152	1.65	.01
Ratio of goal limited to expansive time perspective	1,152	7.10**	.05	1,152	6.87*	.04

Note. Although age was covaried in all analyses, it was not a significant predictor of any goal time perspective score, and results are not shown. Similarly, in no case was the Group  $\times$  Marital Status interaction significant, and results are not shown.

\*  $p < .05$ .

\*\*  $p < .01$ .

\*\*\*  $p < .001$ .



**Table 3**

Within-Group Goal Time Perspective Preferences

Within-subject factor	Time perspective		Time Perspective × Marital Status		Time Perspective × Time Since Metastatic Diagnosis	
	df	F	df	F	df	F
		$\eta_p^2$		$\eta_p^2$		$\eta_p^2$
<b>Metastatic group</b>						
Composite limited—expansive	1,102	6.55*	.06	1,102	5.39*	.05
Present—future	1,102	1.48	.01	1,102	5.64*	.05
Emotion—knowledge	1,102	15.23***	.13	1,102	0.09	.00
Close others—distant others	1,102	0.21	.00	1,102	4.64*	.04
<b>Comparison group</b>						
Composite limited—expansive	1,46	8.61**	.16	1,46	0.95	.02
Present—future	1,46	1.39	.03	1,46	0.92	.02
Emotion—knowledge	1,46	22.81***	.33	1,46	0.00	.00
Close others—distant others	1,46	2.30	.05	1,46	3.11	.06

Note. Although age was covaried in all analyses, it was not a significant predictor of any time perspective score and results are not shown.

\*  $p < .05$ .

\*\*  $p < .01$ .

\*\*\*  $p < .001$ .

Mean Reaction Times (ms) on the Attention Dot-Probe Task for Women With Metastatic Cancer and Comparison Women

**Table 4**

Group	Positive-neutral face pair				Negative-neutral face pair			
	Dot in location of positive face		Dot in location of neutral face		Dot in location of negative face		Dot in location of neutral face	
	<i>M</i>	<i>SE</i>	<i>M</i>	<i>SE</i>	<i>M</i>	<i>SE</i>	<i>M</i>	<i>SE</i>
Metastatic cancer ( <i>n</i> = 85)	517.39	8.14	513.31	7.83	512.17	7.78	516.29	7.99
Comparison ( <i>n</i> = 49)	513.12	9.52	508.08	9.13	509.25	9.25	508.45	8.68

Accuracy Scores and Mean Response Times for the Recognition Portion of the Dot-Probe Task, Presented Separately for Women With Metastatic Cancer and Comparison Women

**Table 5**

Measure and group	Positive encoding				Negative encoding				
	Emotional test		Neutral test		Emotional test		Neutral test		
	<i>M</i>	<i>SE</i>	<i>M</i>	<i>SE</i>	<i>M</i>	<i>SE</i>	<i>M</i>	<i>SE</i>	
Corrected recognition (% hits — % false alarms)									
Metastatic cancer ( <i>n</i> = 82)	.30	.03	.30	.04	.23	.02	.26	.03	
Comparison ( <i>n</i> = 50)	.32	.05	.32	.05	.24	.04	.29	.04	
Response times (ms)									
Metastatic cancer ( <i>n</i> =82)	1348.70	31.46	1339.38	30.37	1333.67	27.63	1351.56	24.67	
Comparison ( <i>n</i> =50)	1213.47	31.37	1200.61	35.72	1183.53	34.40	1189.76	28.37	

*Note.* Positive encoding indicates photos seen in positive-neutral pairs, negative encoding indicates photos seen in negative-neutral face pairs. Emotional test indicates that at test the face was presented in its emotional version, whereas neutral test indicates that at test the face was presented in its neutral version.

**Table 6**

Multiple Regression Analyses Predicting 3-Month Posttraumatic Growth Inventory (PTGI) Scores From Three Separate Goal Time Perspective Scores at Study Entry

Predictor	Goal limited time perspective	Ratio of goal limited to expansive time perspective	Goal expansive time perspective
PTGI at study entry ( $\beta$ )	0.75 <sup>***</sup>	0.76 <sup>***</sup>	0.78 <sup>***</sup>
Age ( $\beta$ )	-0.18 <sup>*</sup>	-0.18 <sup>*</sup>	-0.20 <sup>**</sup>
Months since diagnosis of metastatic disease ( $\beta$ )	-0.02	-0.04	-0.03
Number of comorbid medical conditions ( $\beta$ )	0.00	-0.00	0.02
Years of education ( $\beta$ )	-0.04	-0.03	-0.02
Marital status ( $\beta$ )	-0.12	-0.09	-0.09
Goal time perspective ( $\beta$ )	-0.05	0.10	-0.17 <sup>*</sup>
$R^2$ Goal time perspective	.00	.01	0.03 <sup>*</sup>
$R^2$ model	.60 <sup>***</sup>	.61 <sup>***</sup>	0.63 <sup>***</sup>
$df$ model	7,83	7,83	7,83
$F$ model	20.61 <sup>***</sup>	21.31 <sup>***</sup>	22.96 <sup>***</sup>

Note. Column heading indicates which specific goal time perspective score (limited time perspective, expansive time perspective, or ratio of limited to expansive time perspective) was used in the analysis.

\*  $p < .05$ .

\*\*  $p < .01$ .

\*\*\*  $p < .001$ .

**Table 7**

Multiple Regression Analyses Predicting 3-Month IES Intrusion Scores From Three Separate Goal Time Perspective Scores at Study Entry

Predictor	Goal limited time perspective model	Ratio of goal limited to expansive time perspective model	Goal expansive time perspective model
IES intrusion at study Entry ( $\beta$ )	0.65 ***	0.66 ***	0.65 ***
Age ( $\beta$ )	-0.15	-0.10	-0.08
Months since diagnosis of metastatic disease ( $\beta$ )	0.08	0.02	-0.02
Number of comorbid medical conditions ( $\beta$ )	-0.09	-0.15	-0.12
Years of education ( $\beta$ )	0.13	0.10	0.13
Marital status ( $\beta$ )	-0.07	-0.05	0.01
Goal time perspective ( $\beta$ )	0.61 **	0.07	0.44
$R^2$ Goal time perspective	0.02	0.03 *	0.00
Goal Time Perspective $\times$ Marital Status ( $\beta$ )	-0.81 ***	-0.25	-0.43
$R^2$ Goal Time Perspective $\times$ Marital Status	.06 ***	.01	.02
$R^2$ model	.58 ***	.52 ***	.51 ***
$df$ model	8,82	8,82	8,82
$F$ model	16.31 ***	13.27 ***	12.71 ***

Note. Column heading indicates which specific goal time perspective score (limited time perspective, expansive time perspective, or ratio of limited to expansive time perspective) was used in the analysis. IES Intrusion = Impact of Event Scale, Intrusion Subscale.

\*  $p < .05$ .

\*\*  $p < .01$ .

\*\*\*  $p < .001$ .