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## Do Coping and Social Support Predict Depression and Anxiety in Patients Undergoing Hematopoietic Stem Cell Transplantation?

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### Abstract

This study examined whether different types of coping and social support predict anxiety and depression in 212 hematopoietic stem cell transplant (HSCT) recipients. Data were collected prior to and 6 months after HSCT. Coping, social support, and gender predicted 26% of the variance in pre-HSCT anxiety and 24% of the variance in pre-HSCT depression. Coping and social support did not explain significant post-HSCT anxiety or depression when controlling for pretransplant anxiety or depression. High use of acceptance/resignation coping, cognitive avoidance coping, lower tangible support, and lower belonging support were related to increased pre-HSCT anxiety and depression. Approach coping was not related to pre-HSCT anxiety. Patients who use acceptance/resignation coping and report low levels of two types of social support prior to HSCT may require additional intervention before HSCT, as they are at higher risk for depression and anxiety.

### Keywords

depression; anxiety; hematopoietic stem cell transplant; coping; social support

## INTRODUCTION

Allogeneic and autologous methods of hematopoietic stem cell transplantation (HSCT) are standard treatments for several forms of cancer and nonmalignant diseases. In an autologous stem cell transplant, stem cells are harvested from the patient, whereas in allogeneic transplant, the stem cells are harvested from a related or unrelated donor. Prior to receiving the transplant, patients receive high-dose chemotherapy and possibly total body irradiation. As treatment with HSCT is very aggressive, patients frequently report physical and emotional distress and decreased quality of life within the first 3 years after transplant (Sutherland et al., 1997). Physical consequences of HSCT can include fever, fatigue, nausea, vomiting, mouth sores, infections, and graft-versus-host disease if the patient's body rejects the transplanted cells. In addition, other stressors involved in the HSCT include prolonged hospitalization, invasive medical procedures, isolation, change in appearance, fear of transplant failure, and fear of death, which may exacerbate distress (Lee et al., 2005).

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The results of this study were initially presented as a poster at the 2005 Society for Behavioral Medicine Annual Meeting and Scientific Sessions in Boston, Massachusetts.

Some research indicates that many HSCT recipients experience a wide range of psychosocial problems, such as post-traumatic stress disorder (PTSD) symptoms (Jacobsen et al., 2002; Jacobsen et al., 1998; Lee et al., 2005, Widows, Jacobsen, & Fields, 2000), adjustment disorder (Prieto et al., 2002), depression (Andrykowski et al., 2005; Gaston-Johansson & Foxall, 1996; Lee et al., 2005; Meyers et al., 1994; Molassiotis, Boughton, Burgoyne, & van den Akker, 1995; Syrjala et al., 2004), generalized anxiety (Andrykowski et al., 2005; Gaston-Johansson & Foxall, 1996; Lee et al., 2005, Meyers et al., 1994; Molassiotis et al., 1995), delirium (Prieto et al., 2002), and sexual dysfunction (Molassiotis et al., 1995). However, other research has found that elevations in distress are within the normative range of general medical and surgical patients (Rodrigue, Boggs, Weiner, & Behen, 1993).

The experience of distress during the HSCT process has been linked to adverse effects on health. Higher levels of distress are associated with decreased quality of life and sleep difficulties (Jacobsen et al., 1998), slower recovery and increased physical limitation (Syrjala et al., 2004), and increased length of hospital stay (Prieto et al., 2002). Furthermore, the majority of research indicates that distressed patients who undergo HSCT are at risk for increased mortality (Andrykowski, Brady, & Henslee-Downey, 1994; Colón, Callies, Popkin, & McGlave, 1991; Grulke, Larbig, Kachele, & Bailer, 2008; Hoodin, Kalbfleisch, Thornton, & Ratanatharathorn, 2004; Loberiza et al., 2002; Rodrigue, Pearman, & Moreb, 1999). Optimistic expectations are associated with longer survival immediately after the transplant, but this relationship attenuates over time (Lee et al., 2003). Because of the strong evidence suggesting that negative affect is a risk factor for poor HSCT outcomes and decreased survival, it is important to investigate psychosocial factors that may predict negative affect: coping and social support.

## Coping

People use a variety of strategies to cope with acute and chronic stress. Initial coping research identified two different types of coping styles: problem-focused coping and emotion-focused coping. The purpose of problem-focused coping is to change the source of stress whereas emotion-focused coping is used to reduce or manage the emotional reaction to a specific stressor (Carver, Scheir, & Weintraub, 1989; Wenzel, Glanz, & Lerman, 2002). In addition to conceptualizing coping as problem-focused or emotion-focused, the transactional model of stress and coping focuses on how much a person engages or disengages when faced with a stressor as well as the degree of control a person has over the stressor (Carver et al., 1993; Wenzel et al., 2002). According to the transactional model of stress and coping and the “goodness-of-fit” hypothesis (Conway & Terry, 1992; Wenzel et al., 2002), when a stressor appears to be highly threatening and uncontrollable, people may be more likely to apply disengaging or avoidant strategies to minimize distressing feelings and thoughts. Avoidant coping strategies include distancing, cognitive avoidance, behavioral avoidance, distraction, and denial. Avoidant coping strategies may cause intrusive thoughts that lead to distress over time and are often considered maladaptive (Wenzel et al., 2002). However, the goodness-of-fit hypothesis suggests that emotion-focused or avoidant coping is adaptive when a stressor is highly threatening or uncontrollable (Conway & Terry, 1992). In contrast, if a person perceives a stressor to be controllable and has high self-efficacy for coping with the stressor, he or she may be more likely to use engaging or approach coping strategies, which include active coping, planning, problem solving, information seeking, and the use of social support (Wenzel et al., 2002).

Early empirical studies of the use of coping strategies by adult HSCT recipients were limited by small sample sizes and cross-sectional designs (Andrykowski, 1994). A study by Fife et al. (2000) evaluated the use of four coping strategies during the HSCT process: cognitive coping/positive focusing, avoidance, seeking spiritual comfort, and active coping. Cognitive

copying/positive focusing was associated with less anger prior to HSCT. Avoidance coping (i.e., behaviors that people engaged in to avoid their problems) measured before HSCT was associated with higher levels of anxiety, depression, and anger prior to HSCT hospitalization, when controlling for other variables. None of the methods of coping measured was related to post-HSCT anxiety, depression, or anger. However, there was progressive attrition in participants during the study, with just 48 participants (48% of the original sample) providing data one year after HSCT. In a cross-sectional study of 51 HSCT patients evaluated prior to transplant, symptoms of depression and state and trait anxiety were significantly positively correlated with avoidance coping and acceptance/resignation coping prior to hospital admission for HSCT (Rodrigue et al., 1993). In another study, approach coping measured prior to HSCT was not related to PTSD symptomatology at an average of 6.9 months after HSCT hospital discharge. Participants with higher levels of avoidance coping and lower levels of social support measured prior to HSCT were found to have increased levels of PTSD symptomatology at follow-up (Jacobsen et al., 2002).

### Social Support

There is evidence that social support directly affects health and buffers the effect of stress on health (Cohen & Willis, 1985; Wenzel et al., 2002). Lack of social relationships is associated with higher mortality and morbidity in the general population, even when adjusted for biomedical risk (House, Landis, & Umberson, 1988). According to the transactional model of stress and coping, social support can affect the way that people adapt psychologically to a medical illness (Wenzel et al., 2002). Patients undergoing HSCT depend on others for a variety of needs before hospitalization, during hospitalization, and after the transplant. In patients undergoing HSCT, there is some evidence that high levels of perceived spouse/family social support (Colón et al., 1991), higher social support stability (Rodrigue et al., 1999), and low levels of problematic social support (Frick, Motzke, Fischer, Busch, & Bumeder, 2005) are associated with increased levels of survival. High levels of social support have been associated with decreased levels of anxiety (Meyers et al., 1994), PTSD symptoms (Jacobsen et al., 2002), and distress (Fife et al., 2000) during and following HSCT.

In summary, recent research evaluating coping and distress in HSCT found that disengaging coping strategies were associated with higher levels of distress before HSCT hospitalization (Fife et al., 2000) and increased levels of PTSD symptomatology 6 months following HSCT hospital discharge (Jacobsen et al., 2002). Use of engaging strategies was associated with less anger before the HSCT (Fife et al., 2000) but was not associated with PTSD symptomatology 6 months following HSCT hospital discharge (Jacobsen et al., 1998). The one longitudinal study that evaluated whether coping was associated with increased depression and generalized anxiety was limited by a high level of attrition during the follow-up period. To date, there has been no research evaluating whether different types of social support are predictive of distress prior to and after HSCT.

The purpose of this study was to examine whether different types of coping (approach and avoidance) and different types of social support (tangible, appraisal, and belonging) predict symptoms of depression and anxiety in patients undergoing HSCT. This study utilizes a prospective design with coping and social support measured prior to transplant and anxiety and depression measured prior to and after transplant. In the current study, we hypothesized that greater use of approach coping measured prior to HSCT in four ways (logical analysis, positive reappraisal, seeking guidance/support, problem solving) will be associated with lower levels of depression and anxiety prior to HSCT. In addition, it is anticipated that greater use of avoidance coping measured prior to HSCT by three types of strategies (cognitive avoidance, acceptance or resignation, seeking alternative rewards) will be associated with higher levels of anxiety and depression prior to HSCT. It is also

hypothesized that higher levels of three types of social support (belonging, tangible, and appraisal) measured prior to HSCT will be associated with lower levels of anxiety and depression prior to HSCT. Furthermore, it is hypothesized that when controlling for pre-HSCT depression or anxiety, high use of avoidance coping, low use of approach coping, and low social support will be associated with increased depression and anxiety post HSCT.

It is important to evaluate predictors of anxiety and depression in HSCT patients because of the association between depression and increased HSCT hospitalization and mortality (Andrykowski et al., 1994; Colón et al., 1991; Grulke et al., 2007; Hoodin et al., 2004; Loberiza et al., 2002; Prieto et al., 2002; Rodrigue et al., 1999). The study represents an improvement on previous studies evaluating the relationship between social support, coping, anxiety, and depression because it has a longitudinal design, larger sample size, less participant attrition, and includes several types of approach coping, avoidance coping, and social support as predictors of depression and anxiety.

## METHOD

### Participants

Participants were recruited using a convenience sample at the H. Lee Moffitt Cancer Center and Research Institute in Tampa, Florida. To be included in the study, patients had to (1) be between the ages of 18 and 75 years, (2) have completed at least 8 years of formal education, (3) be able to speak and read English, and (4) have no neurological or psychiatric condition that precluded the completion of study measures or ability to provide informed consent. Ninety-seven percent of eligible participants agreed to participate.

Of the 348 participants consented, 22 (6%) did not receive a HSCT, 46 (13%) died prior to the 6-month follow up, and 68 (20%) did not complete the 6-month follow-up or had missing data, leaving a total sample of 212 (61%) participants. When compared to participants, HSCT patients who did not complete the study had higher levels of acceptance/resignation coping and lower appraisal of support. There were no differences between participants who completed the study and those who did not complete the study in the other types of coping and social support or in baseline anxiety, depression, gender, ethnicity, years of education completed, or type of transplant. The study participants ranged in age from 21 to 73 ( $M = 51$  years,  $SD = 12$ ) and completed an average of 14 years of education ( $SD = 3$ ). The majority of participants were male (53%), currently married (75%), and White (85%; Table 1). The majority of participants (55%) were receiving treatment for multiple myeloma. Most participants (80%) received an autologous transplant.

### Procedure

The design of the study was prospective and longitudinal with data collection occurring prior to HSCT and 6 months after HSCT. The University of South Florida Institutional Review Board approved the study. The study was described to patients who met the inclusion criteria as part of a pretransplant clinical evaluation scheduled for all HSCT patients at the cancer center. All participants provided written informed consent. The questionnaires described in this report were part of a larger battery of psychosocial and neurocognitive measures administered to participants. Participants either completed the psychosocial measures while waiting for hospital appointments or returned them by mail in a self-addressed, postage-paid envelope. Six months after the transplant, participants were contacted by phone and mailed follow-up questionnaires. The participants returned the follow-up questionnaires by mail in a postage-paid envelope or delivered them in person during a follow-up appointment at the cancer center. If participants did not return the questionnaires at either baseline or follow-up, a research assistant contacted the participant

by telephone as a reminder. Participants were paid \$25 at baseline and follow-up to compensate them for the time that they spent completing the questionnaires and neurocognitive tests.

## Measures

As part of the packet of psychosocial measures, participants completed the Coping Responses Inventory (CRI; Moos, 1993) and the Interpersonal Support Evaluation List–Short Form (ISEL-SF; Peirce, Frone, Russell, & Cooper, 1996) at baseline and the Center for Epidemiologic Studies Depression Scale (CES-D; Radloff, 1977) and the State Anxiety subscale of the State-Trait Anxiety Inventory (STAI; Spielberger, 1983) at baseline and follow-up. All measures have been appropriately validated and used in previous research on HSCT recipients (Andrykowski et al., 2005; Jacobsen et al., 2002; Lee et al., 2005). In addition, participants provided the following demographic information at baseline: age, gender, race/ethnicity, number of years of education, marital status, and annual income.

**Coping Responses Inventory–Adult Form (CRI)**—Prior to transplant patients were administered the CRI (Moos, 1993), a 48-item scale that includes four approach coping subscales (logical analysis, positive reappraisal, seeking guidance and support, problem solving) and four avoidance coping subscales (cognitive avoidance, acceptance or resignation, seeking alternative rewards, emotional discharge). For the purposes of this study, participants were requested to reply to each item by indicating how often they engaged in each activity in connection with the cancer and its treatment. As noted in the CRI manual (Moos, 1993), the logical analysis subscale measures cognitive attempts to understand and prepare mentally for a stressor and its consequences. The positive reappraisal subscale measures cognitive attempts to construe and restructure a problem in a positive way while still accepting the reality of the situation. The seeking guidance and support subscale evaluates behavioral attempts to seek information, guidance, or support. The problem-solving subscale measures behavioral attempts to take action to deal directly with the problem. The cognitive avoidance subscale evaluates cognitive attempts to avoid thinking realistically about a problem. The acceptance or resignation subscale measures cognitive attempts to react to the problem by accepting it. The seeking alternative rewards subscale evaluates behavioral attempts to get involved in substitute activities and create new sources of satisfaction. The emotional discharge subscale was not used because there was significant overlap in item content with the measures of anxiety and depression. Each CRI item is measured on a 4-point Likert-type scale (0 = *not at all*, 1 = *once or twice*, 2 = *sometimes*, 3 = *fairly often*). The eight subscales are measured by summing the six items on each scale. Therefore, each scale has a possible range from 0 to 18, with a higher score indicating more frequent use of a type of coping. As measured by coefficient alpha, the internal consistency of the seven subscales used in the study ranged from .60 to .74 in two samples that included participants with depression, participants who abused alcohol, participants with arthritis, and control participants (Moos, 1993). The internal consistency of the seven subscales used in the current study ranged from 0.60 to 0.74.

**Interpersonal Support Evaluation List–Short Form (ISEL-SF)**—A modified 15-item version (Peirce et al., 1996) of the ISEL (Cohen, Mermelstein, Kamarck, & Hoberman, 1985) was used to measure the perceived availability of potential social resources. Three subscales of the ISEL were used to measure tangible support, appraisal of support, and belonging. The tangible support subscale measures perceived availability of material aid. The appraisal subscale measures the perceived availability of someone to talk about one's problems. The belonging subscale measures the perceived availability of people with whom a person can do things. Each subscale consisted of five items selected from the original 10-item subscales of the ISEL. Items were scored on a 4-point Likert-type scale (1 = *completely*



*false*, 2 = *somewhat false*, 3 = *somewhat true*, 4 = *completely true*). The responses on the items were summed to yield a total score for each subscale with a higher score indicating that the participant perceived greater availability of the social resource. Each scale had a possible range from 5 to 20. Internal consistency for the entire scale in patients undergoing HSCT was .81 (Jacobsen et al., 2002). The internal consistency for the three subscales in the current study ranged from 0.67 to 0.84.

**Center for Epidemiological Studies Depression Scale (CES-D)**—The CES-D (Radloff, 1977) is a 20-item measure of depressive symptomatology. The CES-D contains 20 items assessing depressive symptomatology over the past week. Items are measured on a 4-point Likert-type scale [0 = *Rarely or none of the time* (Less than 1 day), 1 = *Some or a little of the time* (1–2 days), 2 = *Occasionally or a moderate amount of time* (3–4 days), 3 = *Most or all of the time* (5–7 days)]. The total score is calculated by summing the item responses after reverse-scoring four items. Therefore, the possible range is from 0 to 60, with a higher number indicating increased symptoms of depression. The CES-D has been recommended for research with cancer patients because it does not include items assessing weight loss, appetite, fatigue, or health concerns (Andrykowski, 1994). In the initial validation study, internal consistency estimates were 0.85 for a household sample and 0.90 for a sample of psychiatric patients (Radloff, 1977). The internal consistency of the CES-D in the current study was 0.86.

**State-Trait Anxiety Inventory–State Anxiety Subscale (STAI)**—The STAI (Spielberger, 1983) is the most widely used measure of state and trait anxiety. The state anxiety subscale is a 20-item measure of state anxiety that is scored on a 4-point Likert-type scale (1 = *not at all*, 2 = *somewhat*, 3 = *moderately so*, 4 = *very much so*). Summed scores range from 20 to 80, with higher scores reflecting more anxiety. For the purpose of this study, scores were converted into z-scores using norms by gender for adults. The internal consistency of the instrument ranges from .86 to .95 across male and female samples (Spielberger, 1983), and was 0.89 in the current study.

### Statistical Analyses

Pearson correlations were computed to determine whether different methods of coping and different types of social support were associated with anxiety and depression prior to and after HSCT. All demographic, medical, coping, and social support variables found significant in correlation analyses were then entered as predictors in regressions predicting depression and anxiety prior to HSCT. Furthermore, two regressions were conducted to evaluate the contribution of coping, social support, medical, and demographic variables on post-HSCT anxiety and depression to determine whether these variables predicted significant independent variance when controlling for pretransplant depression and anxiety. In the regression evaluating post-HSCT depression, all predictor variables that were significantly associated with pre-HSCT depression were entered into a regression with pre-HSCT depression predicting post-HSCT depression. In the regression evaluating post-HSCT anxiety, all predictor variables that were significantly associated with pre-HSCT anxiety were entered into a regression with pre-HSCT anxiety predicting post-HSCT anxiety. The final regressions were reviewed for outliers and collinearity. Outliers were found in each of the regressions. The regressions were conducted without the outliers. However, the results were similar, so all regressions reported include the outliers. All analyses were conducted using SAS (SAS Institute, 2001).

## RESULTS

The data were initially reviewed to determine if demographic and medical characteristics were significantly ( $p < .05$ ) related to anxiety and depression. There was no significant relationship of depression or anxiety with years of education, age, marital status, or type of transplant. Female participants had significantly higher mean anxiety and depression scores at baseline and follow-up and also had higher levels of logical analysis coping, positive reappraisal coping, seeking guidance and support coping, problem solving coping, cognitive avoidance coping, appraisal of support, and belonging support (all  $ps < .05$ ). Therefore, gender was entered as the first predictor variable in all multiple regressions.

As shown in Table 2, mean levels of anxiety and depression of HSCT recipients were not clinically elevated at either pre- or post-transplant. As expected, participants' anxiety decreased over time, and the difference between anxiety at baseline and anxiety at follow-up was statistically significant ( $p < .05$ ; Table 2). Participants' reports of depression symptoms increased from the pre-transplant evaluation to follow-up, but the increase was not statistically significant ( $p = .25$ ).

As shown in Table 3, depression and anxiety prior to HSCT were positively correlated with cognitive avoidance and acceptance/resignation. With respect to approach coping, depression before HSCT was negatively correlated with problem solving coping, and anxiety before HSCT was positively correlated with logical analysis. Depression and anxiety prior to HSCT were negatively correlated with reports of tangible support, appraisal of support, and belonging support. Depression after HSCT was negatively correlated with tangible support. Anxiety after HSCT was positively correlated with acceptance/resignation and negatively correlated with reports of tangible support, appraisal of support, and belonging support. In general, there were moderate to high positive correlations between the dependent variables. The approach coping subscales also displayed moderate to high positive correlations with each other, and the social support subscales displayed moderate positive correlations with each other. The avoidance coping subscales demonstrated low to moderate positive correlations with each other. In general, the avoidance coping subscales showed low positive correlations with approach coping, with the exception of the seeking alternative rewards subscale, which demonstrated moderate positive correlations with all approach coping scales. Overall, the social support scales had no correlation or a low positive correlation with the approach coping subscales, and had no or a low negative correlation with the avoidance coping subscales.

A multiple regression model was conducted to predict pre-HSCT depression by entering gender in the first step and then entering all significant coping and social support variable as predictors. As shown in Table 4, the final model explained 24% of the variance in pre-HSCT depression,  $F(6, 205) = 10.49, p < .0001$ . When controlling for gender, higher levels of acceptance or resignation, lower levels of problem solving, and lower perception of tangible and belonging support were associated with increased depression prior to HSCT. The final model was found to have no evidence of collinearity, as indicated by reviewing variance inflation factor, tolerance, and condition indices.

A second multiple regression model was conducted to predict pre-HSCT anxiety by entering gender as the first step and all significant coping and social support variables as predictor variables. The final regression model explained 26% of the variance in pre-HSCT anxiety,  $F(5, 206) = 14.52, p < .0001$  (Table 5). When controlling for gender, higher levels of acceptance or resignation, higher levels of cognitive avoidance, and lower levels of both tangible and belonging support were all significantly associated with increased levels of

pretransplant anxiety. The final model displayed no evidence of collinearity, as indicated by reviewing the variance inflation factor, tolerance, and condition indices.

In a multiple regression model, pre-HSCT depression predicted 29% of the variance in post-HSCT depression when combined with gender,  $F(2, 209) = 41.38, p < .0001$ . Female gender independently predicted post-HSCT depression, when included in a regression with pre-HSCT depression ( $\beta = .15, p = .01$ ). In a second multiple regression model, pre-HSCT anxiety predicted 25% of the variance in post-HSCT anxiety,  $F(3, 208) = 23.71, p < .0001$ , when combined with gender and belonging social support. None of the coping or social support variables independently predicted post-HSCT anxiety or depression when included in a regression controlling for pre-HSCT anxiety or depression.

## DISCUSSION

The purpose of this study was to examine whether different types of coping (approach and avoidance) and different types of social support (tangible, appraisal, and belonging) predict symptoms of depression and anxiety in patients undergoing HSCT. Results of this study indicate that though patients' reports of anxiety decreased 6 months after transplant, patients' symptoms of depression increased slightly. When combined with gender, coping and social support predicted 26% of the variance in pre-HSCT anxiety and 24% of the variance in pre-HSCT depression.

It was hypothesized that approach coping measured prior to HSCT in four ways (logical analysis, positive reappraisal, seeking guidance/support, problem solving) would be associated with lower levels of distress and anxiety prior to HSCT. Only one approach coping strategy, problem solving, was associated with pre-HSCT anxiety, and no approach coping strategy predicted pre-HSCT depression. These results are consistent with results of the Fife et al. (2000) study. Similar to the current study, Jacobsen et al. (2002) also reported no relationship between approach coping measured prior to HSCT and PTSD symptomatology measured 6 months after HSCT. These results differ from what would be predicted by the transactional model of stress and coping (Wenzel et al., 2002) and other research that indicates an inverse association between approach coping and depression (Herman-Stabl, Stemmler, & Peterson, 1995).

In addition, it was anticipated that greater use of avoidance coping measured by three types of strategies (cognitive avoidance, acceptance or resignation, seeking alternative rewards) would be associated with higher levels of anxiety and depression prior to HSCT. The current study found that greater use of two avoidance coping strategies (acceptance/resignation and cognitive avoidance) was associated with increased pre-HSCT anxiety. One avoidance coping strategy (acceptance/resignation) was associated with increased pre-HSCT depression. With respect to avoidance coping, Fife et al. (2000) also reported that increased use of avoidance coping prior to HSCT was associated with higher levels of anxiety and depression prior to HSCT. However, the current study differed from the results of Fife et al. (2000), in that when the types of coping and social support were entered into the regression predicting depression prior to HSCT, cognitive avoidance did not remain a significant predictor of pre-HSCT depression in the current study. These differences may reflect differences in the constructs measured, as the current study measured cognitive avoidance whereas the Fife et al. (2000) study measured behavioral avoidance. In the current study, use of acceptance/resignation coping indicates a lack of hope, expectation of poor outcome, and low perception of control regarding cancer and its treatment, so it is not surprising that high levels of acceptance/resignation coping are associated with anxiety and depression. This type of acceptance coping differs from more positive acceptance that is used in acceptance-based therapies, such as acceptance and commitment therapy.



According to the transactional model of stress and coping (Wenzel et al., 2002), it was also hypothesized that higher levels of three types of social support (belonging, tangible, and appraisal) measured prior to HSCT would be associated with lower levels of anxiety and depression prior to HSCT. In the current study, lack of belonging social support was a significant predictor of pre-HSCT anxiety. Lack of tangible social support was a significant predictor of pre-HSCT anxiety and depression. With respect to social support, results of the current study are similar to other research indicating that higher levels of support provided by friends, health care providers, and family were associated with a decrease in distress during the HSCT process (Fife et al., 2000). The current study provided more specific information than previous research regarding what type of social support was associated with distress before HSCT.

Furthermore, it was predicted that when controlling for pre-HSCT depression or anxiety, coping and social support variables would explain significant independent variance in post-HSCT depression and anxiety. The current study found that none of the coping or social support variables, which were correlated with pre-HSCT anxiety and depression independently, predicted post-HSCT depression or anxiety when controlling for pre-HSCT anxiety or depression. These results indicate that pre-transplant anxiety and depression are the strongest predictors of post-transplant anxiety and depression among the constructs evaluated. Female gender consistently predicted anxiety and depression before and after the transplant and independently predicted post-HSCT depression when controlling for pre-HSCT depression, which is consistent with previous research indicating a gender difference in depression (Nolen-Hoeksema, 2002).

Although this study improves on past research with the use of a longitudinal design, a large sample size, and the measurement of several different types of approach coping, avoidance coping, and social support, there are a number of limitations that affect its generalizability. First, the study presents correlation analyses, and thus causal relationships cannot be demonstrated. In addition, the sample included participants who were mostly White, married, generally well educated, and primarily recipients of an autologous transplant at a comprehensive cancer center located in an urban area of the southern United States. Different results may be obtained with a sample of participants with different demographic or medical characteristics who are recruited at another location. In addition, the study may be limited by participant bias because 13% of the participants were deceased by the time of the 6-month follow-up, and 20% of the participants did not complete the follow-up assessment. Although nonparticipating patients did not differ from participants in baseline anxiety or depression, it is impossible to rule out whether the nonparticipating patients would have displayed increased anxiety or depression after HSCT or may have decided not to participate because of high depression or anxiety. In fact, nonparticipating patients had higher levels of acceptance/resignation coping and lower appraisal of support. This study is also limited because it did not evaluate the role of disease or treatment variables as predictors of anxiety and depression. The study may also have an inflated Type I error rate due to multiple comparisons. If the level of statistical significance was set at  $p = .01$  to decrease the probability of a Type I error, acceptance/resignation coping would remain a significant predictor of pre-HSCT anxiety and depression, and problem-solving coping would remain a significant predictor of pre-HSCT depression. Female gender would also remain a significant predictor of post-HSCT depression, when controlling for pre-HSCT depression.

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### CLINICAL IMPLICATIONS

Combined with other research, the results of this study have important clinical implications for the treatment of HSCT patients. On average, participants' mean levels of depression and anxiety were not clinically elevated either before or after the transplant, and anxiety decreased significantly following transplant. The decrease in anxiety over time may represent a natural reduction in fear and worry as the result of successfully completing a difficult medical procedure involving hospitalization. The results of the current study also indicated that female patients appear to be at a higher risk for depression and anxiety before and after transplant. Although coping and social support were not predictive of post-HSCT anxiety or depression when controlling for pre-HSCT anxiety or depression, future research is required to determine if these variables are significant predictors of post-HSCT anxiety and depression if measured at the same time as post-HSCT anxiety and depression. It may be important to evaluate social support and coping following transplant as patients' emotional and physical needs change after transplant and hospitalization. Furthermore, there may be other variables, such as disease progression, that were not measured in the current study, which contribute to anxiety and depression following transplant. The findings from the current study and other studies (Fife et al., 2000; Jacobsen et al., 2002; Rodrigue et al., 1993) point to the importance of identifying patients who use avoidance coping strategies as they may be at risk for increased negative affect before, during, and after HSCT. Patients using acceptance and resignation concerning cancer and its treatment may be at a higher distress risk before and during HSCT. These patients may benefit from cognitive techniques that challenge hopeless beliefs and should be encouraged to gain more control over aspects of the HSCT process. In addition, the results of the current study and other studies (Fife et al., 2000; Jacobsen et al., 2002) indicate that patients who lack social support may be at risk for negative affect before, during, and after HSCT. Patients who report that they have few people that they can count on for material aid are at risk for anxiety and depression before the HSCT occurs. Patients who report a lack of people with whom they can engage in activities are at risk for anxiety before HSCT. Thus, having people with whom you can do various activities can serve to distract patients or maintain normal activities, which helps maintain positive affect.

Future research that would build on the evidence accumulated in this and other studies includes evaluating whether coping and social support measured following HSCT is associated with depression and anxiety evaluated at the same time. In addition, research could evaluate whether coping and social support measured prior to HSCT is predictive of positive psychological outcomes and survival after HSCT.

TABLE 1

## Characteristics of Study Participants

Characteristic	Number	Percentage
Gender ( <i>n</i> = 214)		
Male	113	52.8
Female	101	47.2
Marital status ( <i>n</i> = 214)		
Currently married	161	75.2
Divorced	26	12.2
Single, never married	20	9.4
Widowed	4	1.9
Separated	3	1.4
Race and ethnicity ( <i>n</i> = 214)		
White, non-Hispanic	181	84.6
African American	20	9.4
Hispanic	11	5.1
Other	2	1.0
Type of transplant ( <i>n</i> = 214)		
Autologous	172	80.4
Allogeneic	42	19.6
Diagnosis ( <i>n</i> = 214)		
Multiple myeloma	118	55.1
Non-Hodgkin's lymphoma	32	15.0
Breast cancer	14	6.5
Acute myelogenous leukemia	12	5.6
Hodgkin's lymphoma	11	5.1
Chronic myelogenous leukemia	8	3.7
Acute lymphocytic leukemia	7	3.3
Acute lymphocytic leukemia-myelodysplastic syndrome	3	1.4
Testicular cancer	2	0.9
Other	7	3.3
Annual household income ( <i>n</i> = 204)		
Less than \$10,000	10	4.9
\$10,000 to \$19,999	15	7.4
\$20,000 to \$39,999	51	25.0
\$40,000 to \$59,999	49	24.0
\$60,000 to \$100,000	53	26.0
More than \$100,000	26	12.7



**TABLE 2**

Means and Standard Deviations of Study Independent and Dependent Variables

<b>Variables</b>	<b>Mean</b>	<b>Standard Deviation</b>
<i>Dependent variables</i>		
Baseline CES-D score	9.72	7.55
Follow-up CES-D score	10.37	9.70
Baseline STAI-state z score	0.27*	0.92
Follow-up STAI state z score	0.12*	0.93
<i>Independent variables</i>		
Approach coping		
Logical analysis	9.17	3.98
Positive reappraisal	12.16	3.90
Seeking guidance/support	11.33	3.77
Problem solving	11.95	3.81
Avoidance coping		
Cognitive avoidance	7.48	4.03
Acceptance/resignation	6.00	3.54
Seeking alternative rewards	6.74	3.82
Social support		
Tangible	18.35	2.31
Appraisal	18.17	2.19
Belonging	18.09	2.43

Note. CES-D = Center for Epidemiologic Studies Depression Scale; STAI = State-Trait Anxiety Inventory.

\* statistically significant difference between baseline and follow-up STAI-state z scores,  $p < .05$ .

**TABLE 3**  
Correlations of Coping and Social Support Variables with Depression and Anxiety Symptom Severity

	Pre-HSCT CES-D	Post-HSCT CES-D	Pre-HSCT STAI	Post-HSCT STAI	Logical Analysis	Positive Reappraisal	Seeking Guidance/Support	Problem Solving	Cognitive Avoidance	Acceptance/Resignation	Seeking Alternative Rewards	Tangible Social Support	Appraisal Social Support	Belonging Social Support
Pre-HSCT CES-D														
Post-HSCT CES-D	.51***													
Pre-HSCT STAI	.74***	.41***												
Post-HSCT STAI	.48***	.78***	.49***											
Logical analysis	.03	.13	.14*	.09										
Positive reappraisal	-.13	.05	-.03	-.06	.65***									
Seeking guidance/support	-.02	.11	.04	.05	.55***	.58***								
Problem solving	-.15*	.06	-.06	.02	.60***	.68***	.67***							
Cognitive avoidance	.25**	.11	.33***	.12	.27***	.27***	.17*	.21**						
Acceptance/resignation	.32***	.13	.36***	.19**	.23**	.18**	.14*	.11	.41***					
Seeking alternative rewards	-.11	.00	-.02	-.06	.45***	.38***	.40***	.56***	.30***	.15*				
Tangible social support	-.29***	-.15*	-.27***	-.17*	.06	.17*	.05	.13	-.13	-.07	-.02			
Appraisal social support	-.25**	-.06	-.21**	-.14*	.12	.18**	.22**	.16*	-.16*	-.11	.04	.48***		
Belonging social support	-.25**	-.10	-.24**	-.18*	.11	.17*	.30***	.19**	-.10	-.06	.06	.50***	.54***	

Note. CES-D = Center for Epidemiologic Studies Depression Scale; STAI = State-Trait Anxiety Inventory; HSCT = hematopoietic stem cell transplantation.

\*  $p < .05$ ,

\*\*  $p < .01$ ,

\*\*\*  $p < .0001$ .

**TABLE 4**

## Multiple Regression Analysis Predicting Severity of Pre-HSCT Depression Symptoms

Predictor variable	$\beta$	$R^2$ Change	Cumulative $R^2$	$p$
Female gender	0.14	0.02	0.02	.03
Acceptance/resignation	0.27	0.10	0.11	.0001
Tangible support	-0.16	0.07	0.18	.02
Problem solving	-0.18	0.03	0.21	.006
Belonging support	-0.13	0.01	0.23	.08
Cognitive avoidance	0.11	0.01	0.24	.12

Note. HSCT = hematopoietic stem cell transplantation,  $N = 211$ , multiple  $R^2 = 0.24$ ,  $F(6, 205) = 10.49$ ,  $p < .0001$ .

**TABLE 5**

## Multiple Regression Analysis Predicting Severity of Pre-HSCT Anxiety Symptoms

Predictor Variable	$\beta$	$R^2$ Change	Cumulative $R^2$	$p$
Female gender	0.19	0.04	0.04	.003
Acceptance/resignation	0.25	0.12	0.16	.0002
Belonging support	-0.17	0.07	0.22	.02
Cognitive avoidance	0.16	0.02	0.25	.02
Tangible support	-0.14	0.02	0.26	.04

Note. HSCT = hematopoietic stem cell transplantation,  $N = 211$ , multiple  $R^2 = 0.26$ ,  $F(5, 206) = 14.52$ ,  $p < .0001$ .