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Relatedness as an Indicator of Group Cohesion and Its Relationship to Outcomes of a Group-Based CBSM Intervention for Women Who have Completed Treatment for Breast Cancer

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By
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Group delivered empirically supported therapies have been reported to have beneficial effects for cancer patients. However, little is known about the relationship between group cohesion and outcomes of these interventions. This study tested the hypothesis that group cohesion relates to the effects of a group intervention. Participants included 56 women with Stage I – II breast cancer who had completed a 10-week CBSM intervention 3 – 12 months after undergoing surgery and adjuvant therapy. Groups of 3 - 5 participants met weekly for sessions of approximately 1 hour and 45 minutes duration. All participants were assessed at baseline (2 weeks prior to beginning the intervention) and at follow-up (12 weeks after enrollment in the study). Cohesion was measured at the end of each intervention session by External Comfort (EC), a factor of the relatedness scale of the Stüttgarter Bogen instrument (1976). EC denotes an aspect of the individual's sense of comfort within the group that is dependent on how the group participant relates to other members. EC score for session 9 (EC9), and change in EC from session 2 to session 9 (calculated as a change score, i.e., session 9 score minus session 2 score), were used for analyses as independent variables in simple linear regression models. Dependent variables were also calculated as a change score (i.e., follow-up minus baseline) and included benefit finding (Post Traumatic Growth Inventory PTGI, total score and its 5

factors), depression (CESD), urinary cortisol, and natural killer cell function (total percent, number and cytotoxicity). Results yielded a positive change in EC from session 2 to session 9 (M = 2.29, S.D. = 2.67). Regression analyses indicated a significant negative relationship between change in EC9 and change in total PTGI scores (β= -.450, p= .011), and change in Factor 1 Relating to Others (β=-.414, p=.021). A marginally significant negative relationship was observed between change in EC from session 2 to session 9 and the New Possibilities Factor of the PTGI (β=-.323, p=.077). A median split, by change in EC, indicated that participants with high EC scores throughout the intervention showed an increase in total PTGI scores, and in two of the five PTGI factors at follow-up. In contrast, participants who initially scored lower values in EC showed no change in these variables. These results suggest that the longer it takes an individual to feel comfortable in the group, the less the individual would be able to find benefit from their cancer experience after the intervention.

To Jesse

My friend, my rock, my inspiration, my love.

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Chapter 1

Introduction

Empirically supported therapies are often delivered in group settings, not only because they are time and cost efficient, but also as it has been suggested that the processes elicited in the group environment facilitate the outcome of the interventions (Yalom, 1995). Elements of group process have been increasingly receiving researchers' attention as we strive to identify the mechanisms by which group interventions achieve their desired effects. However, research addressing group process and mechanisms of change is still growing and has shown controversial findings.

Group cohesion is an important element of group process for which several researchers have established a relationship to successful therapeutic outcome (Budman, Soldz, Demby, Feldstein, Springer, & Davis, 1989; MacKenzie & Tschuschke, 1993; Marziali, Monroe-Blum, & McCleary, 1997; Yalom, 1995). The current investigation seeks to evaluate if a relationship exists between group cohesion and several outcomes of a cognitive behavioral stress management intervention: posttraumatic growth, depression, coping, natural killer cell count and cytotoxicity, and cortisol in women who have completed their treatment for breast cancer.

Defining cohesion. Although cohesion is one of the most frequently studied elements of group process, researchers seem to be unable to reach a consensus regarding its definition (Bednar & Kaul, 1994; Drescher, Burlingame, & Fuhriman, 1985; Marziali, et al., 1997). Cohesion has been defined and examined within several different fields aside from clinical psychology including sport psychology, sociology, social psychology, counseling and military psychology (Carron & Brawley, 2000). Some definitions of

cohesion include a 'field of forces' acting on individuals to remain in the group (Festinger, 1950), the level of attractiveness of a group to an individual (Gross & Martin, 1952), and a group property that stemmed from the number and strength of mutually positive attitudes towards group members (Lott & Lott, 1965). In psychotherapy, group cohesion has been described as equivalent to therapeutic alliance in individual therapy (Yalom, 1995). However, given the multiple relationships that are established in a group setting, group cohesion is a multidimensional construct that reflects member-to-leader, member-to-group and member-to-member relationships (Burlingame, Fuhriman & Johnson, 2001). Although initial research in group therapy seemed to merge the terms alliance and cohesion, more recent studies tend to use the term alliance to refer to member-to-leader relationships and cohesion to refer to member-to- group and member-to-member relationships (Marziali, et al., 1997).

Even when researchers may seem to agree on the unit of observation when evaluating cohesion, there are many other nuances to defining the construct. Drescher et al., (1985) state that the problem with the empirical analysis of cohesion "resides in both: The concepts lack consensual definition and approaches to investigating them remain unsystematic" (p.4). In studying group cohesion, researchers have included concepts such as a sense of bonding (Piper, Marrache, Lacroix, Richardsen, & Jones, 1983), a sense of working together towards common goals (Budman, et al., 1989), engagement (MacKenzie & Tschuschke, 1993), mutual acceptance, support, affiliation with the group (Bloch & Crouch, 1985; Yalom, 1995), and interpersonal attractiveness of the group (Marziali, et al., 1997). Furthermore, group cohesion has been studied from several different perspectives-- some researchers have evaluated self reports of how an individual

feels within the group (MacKenzie & Tschuschke, 1993), others, as aforementioned, have studied the member's perception of the group leader (Piper et al., 1983; Sexton, 1993), and still others have used group reports by an independent observer (Budman et al., 1989). In a review of the previous 20 years of research regarding cohesion, Drescher et al., (1985) state that the question of who is studied (individual member, leader, relational subgroups and total group) can be categorized in two ways: unit of observation (what the investigator observes) and the unit of analysis (the unit of statistical manipulation). Ideally, fidelity of the results would be greater if the two units were the same; however, most studies of cohesion use individual reports to draw conclusions about cohesion for the whole group. Therefore, continuing this approach would facilitate comparison of results to other published studies on cohesion.

Another dimension of the empirical analysis of cohesion is the measurement strategy. Of the six measurement strategies described by Drescher et al., (1985), verbal style, verbal content, overt behaviors and therapeutic interventions have not been typically used in research of cohesion. The most common strategy used has been that of measuring covert behaviors (thoughts, emotions and perceptions) by self-report measures of attraction to the group or other members, attitude toward group, or degree of investment in the group's purpose. Physical indices are the second most commonly used strategy. These measures include attendance and early termination (Piper et al., 1983; Yalom & Rand, 1966), as well as physical seating distance (Piper et al., 1983). Overt behavior to measure cohesion has been used less frequently and includes shared participation, emotional support and interpersonal trust rated by trained observers (Dies & Hess, 1971). Self-reported perceived cohesion by group members appears to show

stronger relationships to outcome than levels of cohesion rated by outside observers (McNeil, 2006). For this reason, and in order to facilitate comparison of our results to other published studies on cohesion, the current study uses a self-reported measure of covert behaviors.

The dimension of time is also controversial in research regarding cohesion. Although conceptually conceived as a process variable, some studies of cohesion have used scores from one point in time (Marmarosh, Holz, & Schottenbauer, 2005; Marziali, et al., 1997; Silbergeld, Koenig, Manderscheid, Meeker, & Hornung, 1975) or have averaged information from different timepoints into one score (Joyce, Piper, & Ogrodniczuk, 2007; Yalom & Rand, 1966) - thus failing to capture the process of change. Even studies that have looked at change in cohesion have controversial findings. For example, Woody and Adessky (2002) found cohesion not to vary across time while Grabhorn, Kaufhold, and Overbeck (2002) reported a steady increase in cohesion throughout the course of therapy.

In general, operationalization and measurement of cohesion remain unsystematic. The multidimensional nature of cohesion coupled with multiple strategies used by researchers to define and evaluate this construct, have limited research comparing studies in this area (Hornsey, Dwyer & Oei, 2007). Nevertheless, researchers have reported a relationship between group cohesion and positive outcome of group psychotherapy (Budman et al., 1989; MacKenzie & Tschuschke, 1993; Marziali, et al., 1997; Yalom, 1995).

Cohesion and Outcomes of Group Interventions. In an attempt to review research studies that have addressed the relationship between cohesion and outcome, we have

encountered several barriers to comparison. First, we list the aforementioned conceptualization and operationalization barriers. Second, it has been proposed that there are universal factors in group therapy that account for some of the variability in outcome regardless of the active ingredient of therapy. It is in fact unclear whether cohesion and its contribution to outcome vary across different therapeutic settings or maintain universality across them. Research linking cohesion and outcome includes long term psychoanalytic therapy, exposure, counseling, interpersonal group psychotherapy, inpatient therapy models that integrate several therapies, and short term interpretive and support therapy. This wide variety of therapeutic models hampers generalization of results. Third, and in line with conceptualization, it is unclear whether there is a direct relationship between cohesion and outcome, or if cohesion serves as a moderator/mediator of the relationship between outcome and other therapeutic factors. On this subject, Yalom (1995) states, "…group cohesiveness is not only a potent therapeutic force in its own right. Perhaps even more important, it is a necessary precondition for other therapeutic factors to function optimally" (page 49). Furthermore, many of the therapeutic factors that one would consider at face value are often included in the operationalization of cohesion or are highly correlated to it.

Having stated these difficulties in comparing results from different studies, several researchers have established a positive relationship between cohesion and outcomes. Budman and colleagues (1989) found that group level cohesion, as rated by an independent observer, was related to self-reported improvement. They examined the relationship among group cohesion and alliances and outcomes in 12 time-limited sessions of group psychotherapy led by 6 therapists. There was a strong relationship

between measures of cohesiveness and patient-reported outcomes. Moreover, these researchers found that the cohesion exhibited in the first 30 minutes of a session produced the strongest relationship to outcome. Budman's approach to measuring cohesion (independent observer) is rather unusual among cohesion research. Using a more common method, the self-report measure, Marziali et al., 1997, also studied "early cohesion" in a randomized controlled treatment trial of 110 clients with borderline personality disorder. In this study they, found that group cohesion – as measured by the Group Atmosphere Scale (GAS; Silbergeld, et al., 1975), – was significantly correlated with reduction of psychiatric symptoms, social adaptation and reduction of indicators of behavioral dysfunction. Marziali, et al., (1997) placed "early cohesion" during the initial third of the therapeutic process. They argued that during this initial phase of therapy members establish boundaries and develop stable perceptions of their group atmosphere (Silbergeld et al., 1975). MacKenzie (1994) appears to be in agreement with this argument and states that early cohesion may help individual members tolerate the conflict that emerges later in the course of a group. In a cognitive behavioral group setting for a sample of 162 patients with binge eating disorder, Hilbert et al., (2007) found that lower early cohesion was predictive of nonresponse to treatment 1 year after the intervention. Taube-Schiff, Suvak, Antony, Beiling and McCabe (2007) evaluated cohesion in 34 patients participating in a cognitive behavioral group treatment program for social phobia. They established change in group cohesion (at an individual level) throughout the intervention and a positive relationship between increase in group cohesion and improvement in social anxiety symptoms. In general, there appear to be conflictive reports on the benefits of early cohesion (Morillo, 2004; Taft, Murphy, King, Musser, &

DeDeyn, 2003; Tschuschke & Dies, 1994; Yalom & Rand, 1996) vs. late cohesion (Lorentzen, 2008).

Other studies -not distinguishing between early or late cohesion- have also found important associations between cohesion and outcome. In a study published by Hand, Lamontagne, and Marks (1974) group cohesion was found to be significantly related to outcome of an in vivo exposure intervention for patients with agoraphobia. In their innovative approach, Hand and colleagues (1974) evaluated outcome of groups in which cohesion was fostered (members were encouraged to talk about their experience, problem-solve together and pace the group according to the needs of all members) against groups in which cohesion was impeded (members were instructed not to share their experiences, problems were discussed individually with the therapist, group members were just together to receive instructions). Their results indicate that groups in which cohesion was fostered improved significantly over time when compared to those in which cohesion was thwarted.

Recent studies in cancer populations have also established a relationship between outcome of a group intervention and group processes. May et al., (2008) evaluated the outcome of a group-based physical training intervention on 132 cancer survivors. In their study, group cohesion was evaluated using the Group Cohesion Questionnaire (GCQ-22) which rates the existing bond between group members and between each member and the group as a whole. Results of this study suggest that group cohesion was associated with physical functioning and quality of life in women and with better quality of life, less fatigue and better physical functioning in men. Andersen, Shelby and Golden-Kreutz (2007) evaluated the relationships between group cohesion and outcomes of an

intervention for breast cancer patients, their findings suggested that higher levels of cohesion (evaluated as individual perceptions of felt support) covaried with lower distress and fewer symptoms.

Some studies of cohesion have not found a relationship between cohesion and outcome of an intervention. Teasdale, Walsh, Lancashire and Mathews, (1977) unsuccessfully attempted to replicate the findings of Hand et al., (1974). Woody and Adessky (2002) (using the Group Attitude Scale GAS; Evans & Jarvis, 1986) did not find a significant relationship between self-reported cohesion and outcome of a cognitive – behavioral group treatment (CBGT) of social phobia. Additionally, Oei and Browne (2006) reported no relationships between group cohesion and outcome of a CBT group therapy for a sample of patients with mood and anxiety disorders.

Measuring Cohesion. The most common and widely used approach in measuring cohesion is that of self-report measures. Appendix I provides a brief synopsis of the general constructs used in studies that have evaluated group cohesion and outcome. In general, cohesion measures appear to revolve around the concepts of liking the group or feeling attracted to it, feeling compatible with the group, feeling committed to the group, the perception of involvement and concern among group members, and the perception of feeling close to others. Some measures define the construct unidimensionally (the group as a whole), while others make a distinctions between horizontal relationships (member to member, member to group) and vertical relationships (member to leader). Some studies distinguish between alliance and cohesion while others use measures that blend the two constructs together. For a detailed discussion of conceptualization and

operationalization of cohesion please refer to Drescher, Burlingame, and Fuhriman, (1985), as well as Hornsey, Dwyer and Oei (2007).

Relatedness as a Measure of Cohesion. The term *relatedness* was introduced in 1993 by MacKenzie and Tschuschke to describe a measure of the member's emotional comfort in the group. In their study, relatedness is operationalized as the individual's sense of acceptance and support within the group and is closely associated with the concept of group cohesion. This measure concentrates on the socio-emotional aspect of cohesion rather than the task oriented/goal achievement aspect. It defines the construct unidimensionally, as it does not distinguish between member, group or leader relationships and it uses the member as unit of observation (self-report). Relatedness is defined by the measure by which it is assessed and it reflects a sense of the individual's connectedness with the group as a whole during session. Although it involves many aspects of cohesion, the latter is a broader concept that may include other factors not assessed in the relatedness measure. In fact, it may well be that cohesion and relatedness are closely associated because cohesion acts as an antecedent to the development of curative factors in group process that are included in the relatedness measure. Currently, however, there is no empirical evidence on this matter. For the purpose of this study we will use the terms relatedness, comfort and cohesion interchangeably. Cohesion is measured through a 15-item semantic differential questionnaire, the Stüttgarter Bogen (SB) was developed by Lermer and Ermann, and published in 1976 (as cited by MacKenzie & Tschuschke, 1993) (Appendix II). Eight of the items form a subscale entitled "Emotional relatedness to the group". At the end of a session, participants are asked to complete the statement: 'In today's group I felt I was…' using the following

choices: hopeless/hopeful, vulnerable/safe, uncomfortable/comfortable, like a stranger/close to others, miserable/good, confused/seeing things clearly, misunderstood/understood, uncertain about myself/self-confident. MacKenzie and Tschuschke used this scale to measure relatedness for two, long-term inpatient groups. They found a positive relationship between relatedness and outcome. This relationship emerged early in the group and continued throughout. Also using the SB scale, Grabhorn, et al. (2002) evaluated group cohesion for 48 inpatients (aged 17-55 yrs) for over a year. They found that cohesion had a major influence on therapeutic efficacy. Patients who felt comfortable and accepted in therapy groups were also more inclined to experience themselves as self-confident and active. Furthermore, patients who increasingly experienced the group as conflictual in the course of treatment were not able to profit from the treatment.

The relatedness subscale of the Stüttgarter-Bogen was used in the current study to evaluate the member's sense of connectedness during group sessions. This measure was chosen because its short length facilitates administration, it has been used before to evaluate a relationship between relatedness and outcome, and it is appropriate for use in small group settings. In prior research conducted by the current author, a factor analysis of this measure indicated two main factors, internal comfort and external comfort (Morillo, Lopez, Durán, Ironson & Antoni, 2004). Internal comfort (IC) denotes an aspect of the member's sense of comfort within the group that is more dependent on their internal resources. External comfort (EC) denotes an aspect of the individual's sense of comfort within the group that is more dependent on how a participant relates to other members. In a study evaluating internal and external comfort and their relationship with

salivary cortisol, negative mood and relaxation ratings in breast cancer patients undergoing a 10 week CBSM intervention significant variation in internal and external comfort was found across time. External comfort was estimated to increase at a faster rate than internal comfort. Neither of these variables significantly predicted change in cortisol early in the intervention. However, internal comfort early in group (session 2) was a significant predictor of baseline relaxation and mood scores. External comfort early in group significantly predicted mean baseline mood scores. The relationship among comfort, relaxation ratings, and mood changed towards the middle of the intervention. By session 5, internal and external comfort significantly predicted change in relaxation ratings. External comfort predicted both the intercept and the rate of change for negative mood. By session 9, external comfort was a significant predictor of the change in salivary cortisol, but it no longer predicted mood or relaxation ratings. These findings suggested that earlier in the group when relationships are yet to be established, comfort is defined to a greater extent by individual experience (feeling hopeful, feeling good, seeing things clearly, feeling self-confident). However, as the relationships within the group became more established, external comfort became more predominant (safe, comfortable, close to others). In summary, expression of cohesion and its relationship to outcome measures varied from predominantly internal at the beginning of the intervention to a balance between external and internal towards the end (Morillo, 2004).

Our previous study focused on outcome measures within each intervention session. The present study intends to expand on these findings by evaluating if external comfort is related to outcomes measured at the end of a ten week cognitive behavioral intervention for breast cancer patients. In order to narrow the spectrum of outcome variables for this

study, only variables for which group therapy has been described to have an impact were included. Within those variables, an indicator of positive states of mind, an indicator of negative states of mind and two biological outcomes were chosen. Thus, main outcome variables of this intervention included benefit finding (Antoni et al., 2001; Durán, et al., 2004; Lechner, Stoelb & Antoni, 2008; McGregor, Antoni, Boyers, Alferi, Blomberg, Carver, 2004), depression (Antoni et al., 2001; Fawzy, Cousin, Fawzy, Kemeny, Elashof & Morton, 1990; Hienrich & Schag, 1985; Hosaka, Tokuda, Sugiyama, Hirai & Okuyama, 2000), cortisol (Cruess, Antoni, Kumar & Schneiderman, 2000; Cruess, Antoni, McGregor, Kilbourn, Boyers, Alferi et al., 2000; Fox, 2002; Gaab et al., 2003; Morillo, 2004; van der Pompe, Antoni, & Heijnen, 1996;) and natural killer cell activity (Bower, Kemeny, Taylor & Fahey, 2003; Gruber et al., 1993; Ironson, Henderson-Lally, Durán, Weiss & Antoni, 2004).

Benefit Finding

Benefit finding (BF), perceived benefits, posttraumatic growth, stress related growth, and finding meaning are all terms with which investigators have referred to what many consider the same construct: self-reported assessments of positive change in an individual's life in the aftermath of a traumatic or negative life event (Affleck & Tennen, 1996; Bower, Kemeney, Taylor and Fahey, 1998; Janoff-Bulman & Frantz, 1997; McMillen & Fisher, 1998; Park, Cohen & Murch, 1996). According to Tedeschi and Calhoun (2004) many other terms have been used to describe this construct. In the same manner, researchers have used a variety of measures to study benefit finding. Among the most commonly used are the Positive Contributions Scale (PCS; Behr, Murphy & Summers, 1991), a modification of the former for cancer patients (Tomich & Helgeson,

2004) and the Posttraumatic Growth Inventory (PTGI; Tedeschi & Calhoun, 1996). These scales consist of several items rated by the individual using Likert-type scales. Another common way of measuring benefit is by using open-ended questions and expressive writing (e.g., King & Miner, 2000; Pakenham, Sofronoff & Samios, 2004; Stanton, et al., 1998) or coding of interviews by themes (e.g., Fromm, Andrykowski & Hunt, 1996). Issues of measurement create controversy over the generalizability of the construct. Despite this, researchers agree that BF impacts several domains of life including sense of self, relating to others and sense of purpose in life (Bellizzi, 2004; Carver & Antoni, 2004; Weaver, Llabre, Lechner, Penedo & Antoni, 2008). Tedeschi and Calhoun (1996) identified five domains of growth in an effort to offer quantification of the construct. These domains include 1) greater appreciation of life, 2) warmer relationships with others, 3) greater sense of personal strength, 4) new possibilities and 5) spiritual development. The five domains constitute five factors in the PTGI (Appendix III). Studies addressing BF in cancer populations are relatively new and most of them have focused on identifying growth and its relationship to psychosocial and physiological variables (e.g., Cordova, Cunningham, Carlson, & Andrykowski, 2001; Ho, Chan & Ho, 2004; Lechner et al., 2003; Petrie, Buick, Weinman, & Booth, 1999). More recent studies have looked at BF in cancer patients within the context of group therapy (Andersen, et al., 2004, Antoni et al., 2001; Lechner et al., 2008, McGregor et al., 2004).

Benefit Finding and Interventions.

Psychosocial interventions for cancer patients have traditionally focused on reducing the negative effects of the disease. In the latter years, a shift towards positive psychology has lead investigators to evaluate personal growth processes in the aftermath

of a cancer diagnosis. Many clinical populations have reported finding benefit from their experience with illness (Antoni et al., 2001; Bellizzi, 2004; Bower et al., 1998; Cordova et al., 2001; Durán, et al., 2004; Pakenham et al., 2004; Pakenham, 2005; Penedo, Molton, Dahn, Shen, Kinsinger, Traeger, et al., 2006; Tennen, Affleck, Urrows, Higgins & Mendola, 1992. Some controversy exists regarding if, and the ways in which, benefit finding contributes to the patient's emotional or physical well-being (Lechner, Carver, Antoni, Weaver & Phillips, 2006; Stanton, Bower & Low, 2006). Perhaps this is one of the reasons why few interventions have been developed with the main objective of promoting benefit finding. Several studies have consistently shown that a CBSM intervention aimed at reducing stress for a variety of clinical populations has increased BF in both male and female cancer and HIV patients in different stages of disease and treatment (Antoni et al., 2001; Bower et al., 1998; Durán et al., 2004; McGregor et al., 2004; Penedo et al., 2006; Weaver et al., 2008). Antoni and colleagues (2001) tested the effects of a CBSM intervention in a randomized controlled trial including 100 women with early-stage breast cancer. The intervention increased self-reports of positive contributions after cancer. In a similar intervention including 191 prostate cancer patients, Penedo and colleagues (2006) found that the intervention increased benefit finding and that changes in this measure were mediated by development of stress management skills. Durán et al., (2004) studied the effects of a similar intervention for women who had already completed their treatment for breast cancer. Using the PTGI, Durán et al., (2004) found the intervention to have a significant effect in the total score of posttraumatic growth and that this change was mainly reflected in the factors addressing personal strength and appreciation of life.

In a randomized trial including 60 patients, Stanton and colleagues (2002) tested the effects of experimentally induced BF. Patients who had completed their treatment for breast cancer were randomized to three writing conditions of emotional expression. Participants were asked to write about their "deepest thoughts and feelings" regarding her experience with breast cancer, "positive thoughts and feelings" regarding her experience with breast cancer and "facts" regarding her cancer and its treatment. In general, women benefited more from writing about their feelings than from writing about facts. Women low in avoidance found more benefit from writing about their deepest thought and feelings, while women high in avoidance found more benefit from writing about the positive experiences.

These studies also established relationships between benefit finding and other important variables relevant to psychological and physiological well-being. Benefit finding has been associated with emotional processing and quality of life, although no causal relationship has been established. (Antoni et al., 2001; Penedo et al., 2006). McGregor et al., (2004) found that BF predicted changes in lymphocyte proliferation, thus establishing a relationship between positive states of mind and immune functioning.

The neuroendocrine system may also be affected by BF, as Durán et al., found that BF acts as a mediator of changes in urinary cortisol. Stanton et al., (2002) found that women who reported more BF had fewer medical visits for cancer related morbidities. Research examining the relationship between BF and positive outcomes is equivocal. Some studies have established relationships between BF and positive outcomes but they are unable to establish causal conclusions (Tomich & Helgeson, 2004). Other studies

have found no significant cross-sectional relationship between BF and other positive outcomes (e.g., Cordova et al., 2001; Fromm et al., 1996).

How does BF develop? Some investigators have suggested, that the development of BF is a result of cognitive processing (Bower & Segerstom, 2004; Tedeschi & Calhoun, 2004). This process is elicited when the traumatic event shatters the individual's personal schemas regarding self and world view (Janoff-Bulman, 1992; Lechner et al., 2006). The individual is triggered to include the threatening event into his life narrative in such a way where now the new schemas have personal meaning (Neimeyer, 2004). Adequate group therapy may provide a conducive environment for the evaluation of old schemas and the development of the new ones (Neimeyer, 2004; Tedeschi & Calhoun, 2004). Patients attending cognitive-behavioral group therapy may benefit from three important factors: first, the opportunity to tell their story in an empathetic forum (Tedeschi & Calhoun, 1996) which allows for emotional expression and disclosure. Second, social support offered by trained therapists and other group members with similar experiences may provide a high tolerance for distress that may not be found in other areas of the participant's life. Third, learning and practicing cognitive restructuring tools and stress management techniques will promote repeated reflection on the traumatic event and in consequence facilitate the development of new schemas. These factors may play a critical role in the post-traumatic growth process. The current study proposes that the degree of comfort experienced by a participant in the group may have an effect on all or some of these factors and thus be related to changes in posttraumatic growth. We propose that participants who feel more comfortable throughout the group will report more benefit finding. In contrast, participants who do not feel comfortable in the group

will have to divert some of their cognitive and emotional processing into feeling more at ease in the group environment. We anticipate these participants will report less benefit finding as they will not fully experience the therapeutic factors proposed to foster the development of posttraumatic growth within a group setting.

Cortisol and HPA functioning

The HPA axis plays a major role in the response to stress, in conjunction with the sympathetic nervous system (SNS). In the presence of a stressful situation, the hypothalamus releases corticotropic releasing hormone (CRH) and vassopressin-arginin, which in turn stimulate the production of adrenocorticotropic hormone (ACTH) by the pituitary. The end product of this chain of stimulation is cortisol, a glucocorticoid hormone produced by ACTH stimulation of the adrenal gland. Negative feedback of cortisol on CRH and ACTH production is achieved before cortisol reaches its highest physiologic plasma levels. Secretion of cortisol has been classically described as following a circadian rhythm. Levels of cortisol peak in the early morning and follow a rapid decline during the day, reaching a nadir around midnight and begin to rise between 1 am and 4 am (Gavrila, et al., 2003; Williams, 1985).

Cortisol receptors are widely distributed in different bodily tissues, thus cortisol mediates a variety of vital functions. In the liver it increases gluconeogenesis, in peripheral tissue it inhibits glucose uptake and utilization (insulin resistance), and in adipose tissue it activates lipolysis and adipocyte differentiation. In skin, muscle and connective tissue, cortisol reduces collagen synthesis and production. In bone it inhibits osteoblast function. Cortisol also plays an important role in salt and water homeostasis, blood pressure control, and in the suppression of immunologic responses. In the central

nervous system (CNS), cortisol's effects are closely tied to mood and affect. Several investigations have detected a significant relationship between mood and secretion of cortisol. Anger and depression have been described to have a positive relationship with cortisol secretion. Positive affect has also been associated with lower levels of cortisol, although less frequently (Smyth et al., 1998).

Cortisol levels can be measured in plasma, urine and saliva. Over 90% of circulating cortisol is bound to proteins, mostly to alpha2-globulin cortisol-binding globulin (CBG). Blood sampling requires certain safety measures that make its use difficult in field studies. Furthermore, venipuncture can be a strong stressor for certain individuals and alter cortisol values. So, while plasma cortisol is considered the gold standard in both research and clinical settings, measurement of cortisol in saliva has gained popularity among researchers. It is a non-invasive method that causes little discomfort and is of low cost (Kirschbaum & Hellhammer 1989). Salivary cortisol is independent of salivary flow rate (Kirschbaum & Hellhammer, 1994) and has been found to be directly proportional to serum unbound cortisol concentrations in both normal and clinical populations (Kirschbaum & Hellhammer, 1994; Kos-Kudla, Buntner, Marek, Ostroswska, & Swietochowska, 1996; Laudat, et al., 1988; Putignano et al., 2001; Vining, McGinley, Maksvytis, & Ho, 1983).

After a stressful event, activation of the HPA axis produces a peak of cortisol at around 20 to 30 minutes (Gold, Zakowski, Valdimarsdottir, & Bovbjerg, 2003; Kirschbaum & Hellhammer, 1989). Responses to stressful events or short-term reactivity are best measured through salivary or serum cortisol. Urinary free cortisol is the cortisol excreted through the kidneys, and it represents only 1% of the total cortisol

secretion rate. Diurnal changes in urinary cortisol show a lag of approximately four hours relative to plasma and salivary cortisol (Morineau et al., 1997). Yehuda and colleagues (Yehuda et al. 2003) state that "time integrated measures of cortisol and averages of multiple independent cortisol samples may provide different information" (page 351). In that sense, 24 or 15 hour free urinary cortisol provides information about the total diurnal production of cortisol but tells us little about short-term variation, daily slope and reactivity to stressors. Although the mechanisms by which relaxation contributes to downregulation of the HPA axis are poorly understood, a decrease in level of arousal and an enhancement of positive mood are thought to be major contributors to the process. Therefore, when an individual experiences a decrease in arousal or elicits positive mood, it is expected that their salivary cortisol will decrease within 30 minutes of the positive experience. Furthermore, if this response is maintained in time, the individual will likely reflect a decrease in urinary cortisol.

Cortisol and Breast Cancer

Dysregulation of the HPA axis has been a common finding among cancer patients. Alterations include flattening of the diurnal slope, erratic fluctuations and consistently high levels of cortisol (Sephton, Sapolsky, Kraemer & Spiegel, 2000; Touitou, Levi, Benavides, Bailleul, & Misset, 1995). According to McEwen's (1998) theory of allostasis, these variations could be explained by a wearing down of the neuroendocrine regulation system. This wearing is due to the constant physical and psychological stressors that cancer patients face throughout the course of the disease. In this sense, a cancer patient faces allostatic overload. Allostatic overload is defined as altered and sustained activity levels of cortisol in response to the physical and psychological

challenges of a cancer diagnosis. This theory is consistent with the difference in cortisol patterns found among early-diagnosed survivors and metastatic cancer patients. Several patterns of alterations have been described. In a study comparing 21 early-stage breast cancer patients, 8 metastatic breast cancer patients and 15 healthy controls, van der Pompe, Antoni and Heijnen (1996) found that metatastic patients had significantly elevated basal levels of serum cortisol compared to early-stage breast cancer patients, and both cancer groups had significantly elevated serum basal cortisol levels compared to healthy controls. Furthermore, when compared to healthy controls, metastatic patients exhibited blunted responses of the HPA axis to stressful situations instead of the normal elevation of cortisol levels following acute stress. Consistent with these findings, another study including 33 breast cancer survivors (Porter, et al., 2003) found that breast cancer survivors had high basal levels of salivary cortisol and blunted cortisol to stressful situations compared to healthy controls. Although prolonged stressful situations have been described in some circumstances to be accompanied by low cortisol levels as a result of depletion and wearing down of the stress response (McEwen, 1998), it should be noted that these two studies show that both patients with metastatic breast cancer and breast cancer survivors have been found to have elevated cortisol levels. In a study of 25 breast cancer survivors, Bower et al., 2007 demonstrated that fatigued breast cancer survivors showed a blunted cortisol response to a psychological stressor.

Further research is needed to determine if these alterations of the normal patterns of functioning in the HPA axis precede the onset of the disease, are consequences of physiological and/or psychological changes during the course of it, or are simply the reflection of individual differences (independent of the disease process) in the diurnal

cycle of cortisol (Smyth et al., 1997). In a study by Gold and colleagues (2003), 96 women were evaluated to determine the relationship between endocrine responses and psychological stress in women with familial risk for breast cancer. They found that compared to women with normal risk, those with familial risk have higher peaks of plasma cortisol after a stressor. They suggest that familial risk of breast cancer is a chronic stressor that can lead to an altered endocrine response. However, it is also possible that physiological or genetic characteristics of the women at risk also predispose to a heightened endocrine response. In the study performed by Smyth and colleagues (1997), diurnal cortisol patterns were studied in 127 community subjects over a period of two days. They identified three different groups with distinctive diurnal cycles (normal cycle, inconsistent cycle, and no cycle). No demographic or psychological variables were associated with these groups. The same investigators found that psychological factors are closely related to momentary cortisol secretion. Specifically, Smyth et al., (1998) studied the relationship between stressors and mood and salivary cortisol in the same sample of 127 healthy participants. They found that higher salivary cortisol levels were associated with both current problems and the anticipation of a stressful event. Furthermore, they found that positive affect was significantly associated with lower cortisol levels.

Another study found a significant negative relationship between salivary cortisol levels and quality of social support in 103 women with metastatic breast cancer (Turner-Cobb, Sephton, Koopman, Blake-Mortimer & Spiegel, 2000), supporting the notion that high quality social support may buffer the neuroendocrine response to stress. The clinical significance of these findings may expand beyond the issue of quality of life into

that of survival time. Cortisol has immunosuppressive actions that may impair the body's ability to fight cancer. Also, cortisol may help stimulate tumor cell growth (Sapolsky & Donnelly, 1985). Findings suggest that the dysregulation of the cortisol response may be linked to disease progression. Sephton et al., (2000) evaluated salivary cortisol 4 times a day for three consecutive days in 104 women with metastatic breast cancer. They found that the alteration of the normal circadian variation of cortisol to a flattened profile was a strong predictor of early mortality. They also found that flattened cortisol slopes were related to low counts of natural killer cells and low natural killer cell activity. These findings are of particular importance as it was the first study to establish alterations of the cortisol slope as a predictor of breast cancer progression. Furthermore, it opened the door to exploration of the relationship between cortisol secretion, psychological factors and psychological interventions.

Cortisol and Psychological Interventions

Under the premise of the relationship between cortisol secretion and psychological factors, several psychological interventions have aimed to reduce cortisol levels. Gaab, et al. (2003) in a randomized trial, studied the effects of CBSM on salivary cortisol responses on 48 healthy subjects. They found that the intervention group experienced a significant attenuated cortisol response to a stressor, compared to the control group. Cruess et al., (2000) examined the effect of CBSM in a randomized trial of 34 women with Stage I or II breast cancer. They found a significant reduction in serum cortisol and significant increase in benefit finding after the intervention. Similarly, van der Pompe et al., (1996) studied the effects of experiential-existential group psychotherapy on endocrine function. In their study, they found a significant effect of the intervention on

cortisol levels for patients with high cortisol baseline. In a randomized trial among HIV-seropositive men, Cruess et al., (2000) found that patients participating in a 10-week, group based CBSM intervention experienced decreased salivary cortisol baseline levels across the 10-week period. This decrease in cortisol was related to frequency of relaxation practice and to decreases in global measures of total mood disturbance and anxious mood. In a sample of breast cancer patients who had undergone adjuvant treatment Durán et al. 2004, found that benefit finding reported by participants mediated the lowering effect of a CBSM intervention on urinary cortisol. Using the same sample, Morillo (2004) reported a significant decline of within session salivary cortisol towards the end of the intervention, suggesting that participants had become more effective in lowering their levels of arousal by the end of the 10-week CBSM intervention. Despite widespread evidence that psychological interventions can modify cortisol secretion, the exact mechanisms by which these changes occur throughout a CBSM intervention have not been fully elucidated. Cruess' findings suggest that changes cortisol levels may be a consequence of mood changes, specifically reductions in anxiety and distress. In support of this notion, Fox (2002) found that among 52 early-stage breast cancer participating in a 10 week CBSM intervention randomized trial salivary cortisol significantly decreased at the end of the interventions as did negative mood ratings. The present study intends to explore if an individual's sense of comfort and connectedness in a group setting is reflected by lower urinary cortisol levels by the end of the 10-week intervention. We anticipate that feeling more comfortable within a group setting will activate positive states of mind and perhaps be related to the buffering effects of social support which in turn, may decrease the production of urinary cortisol. In addition, changes in salivary

cortisol within session will be used as predictors of outcomes of the intervention. As aforementioned, results of a previous study with the same population sample (Morillo, 2004) indicate a significant decline in salivary cortisol by the end of session 9 of the intervention. In the current study, we intend to explore if this change in salivary cortisol is related to psychosocial and biological outcomes of the intervention. We anticipate that participants who experience a greater decline in salivary cortisol within session 9, will in turn report more benefit finding, less symptoms of depression, will have lower levels of urinary cortisol and improved natural killer cell cytotoxicity function.

Natural Killer Cells

Natural killer (NK) cells constitute the first line of defense against tumors (Whiteside & Herberman, 1994). It is believed that, throughout the natural history of cancer, alterations in the optimal functioning of immune mechanisms may open several windows of opportunity for malignant cells to escape immunologic responses at different stages of tumor development (Ben-Eliyahu, Page & Schleifer, 2007). Fuchs and Matzinger (1996) state that angioneogenesis exposes the immunogenic neoplastic cells to the blood stream, triggering the immune system's response. In some cases, malignancies will be suppressed at this stage. Some theories propose that the same immunologic pressure that may eradicate malignancies in early stages of development, provides a selection process through which cancer cells with more elaborate methods of escape are able to survive and reproduce (Ben-Eliyahu et al., 2007). Thus, a malignant cell that has "evolved" into a tumor will already have evaded several mechanisms of immunological surveillance (Pawelec, 2004). A second window of opportunity for the immune system to target malignant processes is proposed to occur at the beginning of the metastatic stage or

in situations in which metastasis are more likely to occur (such as during surgical manipulation of a tumor). Neoplastic cells leave the "protective environment" of the primary tumor and are exposed to new lines of white blood cells in new microenvironments, which could render them more vulnerable to the immune response (Ben-Eliyahu, et al., 2007). Preliminary evidence suggests that psychological interventions, may play a role in retarding tumor development and tumor progression (Fawzy et al., 1990; Spiegel, Bloom, Kraemer, & Gottheil, 1989). Unfortunately the mechanisms of change have not been fully elucidated. Ideally, pairing the timing of the intervention with the aforementioned crucial stages of vulnerability would optimize the effectiveness of the intervention. Researchers are yet to establish the clinical significance of this assumption. Meanwhile, our current study aims to contribute to the literature establishing a general linkage between psychological and immune functioning.

Psychoimmune associations have been documented for several populations including cancer patients, HIV patients and healthy populations, among others (Kemeny & Schedlowski, 2007; Antoni et al., 2006; Greeson et al., 2008; Sergestrom & Miller, 2004; Spiegel, et al, 1989; Bloom, Kraemer, & Gottheil, 1989; Spiegel & Sephton, 2001; Ironson et al., 2005). Notably, the mechanisms by which immunocellular processes are influenced by psychosocial variables remain the subject of investigation. It is believed that this relationship is mediated through the HPA axis, the sympathetic nervous system and the release of cytokines that occur through activation of the central nervous system (Glaser & Kiecolt-Glaser, 2005; Kemeny & Schedlowski, 2007). Stressful situations can, depending of the nature and longevity of the stressor, have an impact on immune functioning. For instance, bereavement is associated with decreased natural killer cell

cytotoxicity and increased cortisol levels. In general, stressors that become chronic are associated with functional changes in the immune system (Segerstrom & Miller, 2004). Although controversial, there are well documented relationships between positive states of mind and enhanced immune function and negative states of mind and impaired immune function (Tsuboi et al., 2005; Von Ah, Kang, & Carpenter, 2007; Byrnes et al., 1998; Cohen, Doyle & Skoner, 1999; Segerstrom, Taylor, Kemeny, & Fahey, 1998; Futterman, Kemeny, Shapiro & Fahey, 1994). In the specific case of natural killer cells, research using animal models of stress has demonstrated a relationship between NK number, natural killer cell cytotoxicity (NKCC) and stress: higher levels of stress result in impaired NK functioning (Ben-Eliyahu, Yirmiya, Liebeskind, Taylor, & Gale, 1991). In addition, highlighting the role that NK cells may play in cancer progression, investigators have found that breast cancer patients have reduced numbers of natural killer cells (Brittenden, Heys, Ross & Eremin, 1996), impaired NKCC with advanced disease (Akimoto et al., 1986), and an inverse relationship between NKCC and cancer recurrence (Levy, Herberman, Lippman, D'Angelo & Lee, 1991). Under the premise of an established, if yet to be fully understood, relationship between stress and immune function, several interventions have been aimed at modifying an individual's reaction to stress in hopes of impacting immune responses and its relationships to pathological conditions.

Although the active components of interventions which directly affect immune parameters remain largely unknown, several researchers have documented effects of cognitive behavioral stress management interventions on immune function for a variety of clinical populations including breast cancer patients (Ironson et al., 1994; Chesney,

Chambers, Taylor, Johnson & Folkman, 2003;Wang & Li, 2006; McGregor et al., 2004) These findings support the rationale that psychological interventions may have a positive effect on NK functioning in breast cancer patients. Several mechanisms have been proposed to account for the effects of CBSM interventions on immune function (Bower & Segerstrom, 2004). It is possible that immune changes may be closely tied to changes in cortisol levels. Stress management and relaxation practices may result in a parasympathetic response that regulates cortisol production, which in turn may modify NK function. Other proposed mechanisms involve cognitive processing and the production of certain cytokines which may contribute to this relationship. Finally, learned utilization of social support during the intervention, social support elicited within the group or a combination of these two factors may explain immune changes that occur during a CBSM intervention. In fact, social support has often been reported in the literature as having a positive relationship with immune functioning (Uchino, 2006). Although an empirical relationship has not been established between EC and social support, theoretical conceptualization of these variables suggests that they may be closely related. The present study intends to contribute to the pool of information addressing the possible mechanisms by which CBSM may impact immune functioning. Previous findings, using the same sample, suggested that CBSM contributed to enhancement of immune function (Durán et al., 2004). We hypothesize that the levels of comfort experienced by participants throughout the group will be related to changes in immune function, specifically that as participants feel more comfortable in the group setting, they will also experience positive change in parameters measuring their immune response.

Depression

Women handle a multiplicity of roles in their everyday lives. Clinical experience has taught us that many of the participants in the breast cancer study are employed, have children, are caregivers for other family members and participate in community activities. This wide range of activities and responsibilities may account for many of the stressors in women's lives (Bloom, Stewart, Johnson, Banks & Fobair, 2001). Being diagnosed with breast cancer and enduring its treatment may explain why these patients are at a higher risk for developing depression (Compas, et al., 1999; Bloom et al., 2001). In fact, it is estimated that in 20 to 30% of breast cancer patients the symptoms may be severe enough to justify a clinical diagnosis of depression (Golden-Kreutz & Andersen, 2004). Women reporting depression also report more worry (Cunningham et al., 1998), lower quality of life (Ganz & Lerman, 1992), and higher degrees of pain (Bloom, Stewart, Johnson & Banks, 1998) than patients who don't report symptoms of depression. Psychosocial interventions have proven effective in reducing distress, improving mood and reducing depressive symptoms among women with breast cancer. Although the precise mechanisms of change remain to ascertain, it has been suggested that social support offered in the group may lower depression and promote psychological adjustment (Helgeson & Cohen; 1996; Spiegel et al., 1989). In light of these facts, group cohesion may influence the effects of the intervention on depressive symptoms.

EC and Outcome of CBSM

Cortisol levels, benefit finding, natural killer cells number and function, and depression have been previously found to improve in a sample of breast cancer patients randomly assigned to a 10-week CBSM intervention (Durán et al, 2004). In an effort to

contribute to the literature addressing the active components of an intervention, the current study (using the same sample) sought to explore if an aspect of group cohesion, mainly how comfortable individuals feel within a group, was related to the reported changes in outcomes. We propose that participants who feel more comfortable within a group setting would be more likely to gain from their group experience and that this would be reflected in better outcomes. The present is a descriptive study that intends to bring these relationships into evidence as a starting point for future researchers to address the mechanisms involved.

Chapter 2

Methods and Procedures

Participants

The analyses were performed only on women assigned to the intervention condition. This included 56 women who had been diagnosed with breast cancer within the last two years and had completed all adjuvant treatment at least three months before enrollment. Women from the Miami-Dade and Broward counties participated in the Coping After Treatment Study (CAT), a 10-week CBSM randomized controlled trial for women who have completed their treatment for breast cancer. Recruitment efforts included mailings from physicians to their patients and advertisement in medical offices, cancer organizations and local newspapers. Women who were interested in participating contacted the study and were screened over the phone in order to determine eligibility. Exclusion criteria included a previous diagnosis of cancer, age over 65, advanced stage of breast cancer (IV), acute or chronic co-morbid medical condition with known effects on the immune system (e.g., HIV infection, autoimmune disease, history of endocrine disorders), patients taking medication that act directly as immunomodulators (e.g., interferons), active treatment for cancer (excluding Tamoxifen and other estrogen inhibitors), major psychopathology and substance dependence in the past year, history of inpatient psychiatric treatment, or previous participation in the same or a similar study.

Procedures

During the phone screen women were advised that participation required their agreement to be randomized to either a 10-week CBSM intervention or a control condition of a 1-day seminar. Once a woman agreed to participate in the study and was

considered eligible, she was mailed a questionnaire packet and scheduled to come in for the baseline assessment. Participants were randomized to the intervention or control condition once they had completed and returned their baseline questionnaire packet.

Intervention and control groups ranged from 3 to 6 women. Groups met in large conference rooms with adequate lighting, temperature and furniture. Sites for group meetings included the Coral Gables Campus and Plantation General Hospital. During relaxation exercises women were given the option of mats or comfortable chairs. Groups in both conditions were led by two female therapists previously trained within the protocol.

Intervention group

The CBSM intervention consisted of ten, 2 hour weekly sessions. Each of the ten-week sessions contained a relaxation training component and a didactic information component and had an approximate duration of 45 to 50 minutes.

The relaxation component consisted of the instruction and practice of a different relaxation technique each week. These included progressive muscle relaxation (Bernstein and Borkovec, 1973), autogenics (Luthe, 1969), guided imagery (Mason, 1986), meditation (Benson and Klipper, 1976) and abdominal breathing (Davis, Eshelman, & McKay, 1988).

The didactic component included information on physiological effects of stress, recognizing and evaluating emotional, physical, and behavioral responses to stress, identifying negative automatic thoughts and cognitive distortions, cognitive restructuring, adaptive coping responses, anger management, utilizing social support, assertiveness techniques and definition of goals and values.

In order to determine change in group cohesion, 2 sessions out of ten were evaluated. One session was chosen to represent the beginning of the intervention (session 2), another to represent the end of the intervention (session 9). Individual reports of relatedness were completed at the end of each session.

Salivary cortisol was collected at three timepoints for each session: before the relaxation component (pre-relaxation), between the relaxation component and the didactic component (post-relaxation) and after the didactic component (end-session).

Outcome measures for this investigation were collected at repeated individual appointments 2 weeks, 9 and 15 months after CBSM completion. The scope of the current study only extends to evaluation of change from baseline values to 2 weeks after the end of the intervention. Therefore, change in outcome variables was calculated as the score or value reported 2 weeks after the intervention minus the score or value obtained at baseline. Participants were asked to complete assignments between sessions and to practice relaxation techniques. Homework included short exercises that reviewed the previous week's material, and a sleep and relaxation practice log. Adherence to manualized treatment was ensured through weekly supervision of audio- or video-taped sessions.

Measures

Control measures. At the initial assessment, information on demographics, severity of illness, and health behaviors were obtained. Demographic variables included age, ethnicity, education, employment status, and marital status. Since disease severity variables may have an impact on cortisol levels (van der Pompe, et al., 1996) information on the participant's stage, number of positive lymph node, menopausal status, surgery

type (e.g., lumpectomy or mastectomy), and adjuvant treatment (e.g. chemotherapy, radiation, Tamoxifen, Femara) was collected. Other control variables include time since diagnosis and time since completion of treatment.

External Comfort (a predictor). External Comfort was measured using one factor of a subscale of a 15-item semantic differential questionnaire, Stüttgarter Bogen (SB). Eight of the items form a subscale named "Emotional relatedness to the group". At the end of a session, participants are asked to complete the statement: 'In today's group I felt I was…' using the following choices: hopeless/hopeful, vulnerable/safe, uncomfortable/comfortable, like a stranger/close to others, miserable/good, confused/seeing things clearly, misunderstood/understood, uncertain about myself/self-confident. Items are rated on a 6-point differential scale. A factor analysis of this measure performed in previous research with the same database indicated two main factors (Morillo, 2004). From the first factor emerged the *internal comfort* score, comprised by the items hopeless/hopeful, feeling miserable/feeling good, confused/seeing things clearly and uncertain about myself/self-confident ($\alpha = .88$). These items denote an aspect of the member's sense of comfort within the group that is more dependent on their internal resources. From the second factor emerged an *external comfort* score, integrated by the items vulnerable/safe, uncomfortable/comfortable and like a stranger/close to others ($\alpha = .90$), which as a group denote an aspect of the individual's sense of comfort within the group that is more dependent on the social context, or how they relate to other members. To this factor we added the remaining item of SB scale "understood/misunderstood" which at face value appeared to be related to external comfort. Inclusion of this item yielded a final Cronbach's $\alpha = .80$. This investigation used

External Comfort as a predictor variable in two different ways. The first was External Comfort in Session 9 and the second was Change in External Comfort, which was calculated as the score in session 9 minus the score in session 2. Appendix II contains the SB questionnaire and indicates the items used for External Comfort. For the purpose of data analyses, items 2 and 4 were directly recoded into values from 1 through 6, reverse scored items were also recoded so that a higher score indicated higher levels of comfort. Values were then added to yield a final EC score ranging from 4 to 24.

Salivary cortisol session 9 (a predictor). Salivary cortisol was measured between the hours of 6:00 pm and 9:00 pm with an interval of approximately 45 to 50 minutes. Salivary cortisol was measured at sessions 2, 5 and 9 of the intervention. The current study only used salivary cortisol data for session 9 as previous findings, using the same sample indicated a positive relationship between Session 9 salivary cortisol and session outcomes (Morillo, 2004). Participants were given a plain (non-citric acid) cotton salivette to place in their mouth. No food or drink (except for water) was to be ingested up to 15 minutes before the sample was taken in order to prevent pH changes in saliva. Participants were instructed to hold the cotton swab on top of their tongue, without sucking or chewing on it. When the cotton swab was soaked, it was placed in a tube labeled with the participant number, date, timepoint and time of collection. Saliva samples were then frozen prior to assay in order to precipitate mucins. Samples were analyzed using the Salimetrics HS-Cortisol kit (Salimetrics, State College, PA). This is an enzyme immunoassay (ELISA) kit specifically designed for the quantitative measurement of salivary cortisol. Assay sensitivity was <. 007 ug/dl.

Benefit Finding (an outcome). The posttraumatic growth inventory (PTGI) is a 21-item scale that uses a 6-point Likert type response format (105 possible points) ranging from "I did not experience this change as a result of my crisis" (scored 0), to "I experienced this change to a great degree as a result of my crises" (scored 5). Intermediate scores were given for a very small degree (1), a small degree (2), a moderate degree (3), and a great degree (4). The 21 items are grouped into five factors including New possibilities, Relating to Others, Personal Strength, Spiritual Change, an Appreciation of Life (Tedeschi & Calhoun, 1996).

Depression (an outcome). Participants completed the CES-D (Appendix IV) questionnaire (Radloff, 1977) 2 weeks, 9 and 15 months after CBSM completion. This questionnaire is a 20-item Likert-type scale ranging from 0 (rarely) to 3 (most of the time). Items are worded as first person sentences and queries on somatic symptoms, affect, cognitive and motivation aspects of the patient's life. This questionnaire has been validated in several populations (Myers and Weissman, 1980; Schulberg et al., 1985).

Urinary Cortisol (an outcome). Urinary cortisol was collected in a container treated with 1 g of sodium metabisulfite (a preservative). Participants were asked to collect all urine produced between 6 PM and 9 AM of the day of the assessment (15 hour collection). Urine was to be kept refrigerated or on ice until brought to the assessment site. In addition, participants were asked to abstain from substances that might affect hormonal levels, such as caffeine, cigarettes, alcohol and antihistamines. At the time of assessment, urine was collected by a researcher and transported to the laboratory. Once in the laboratory, two aliquots of 10 ml each were frozen at -20 C until assay with a radioimmunoassay commercial kit.

NK Cell Cytotoxicity (NKCC) (an outcome). Blood samples to evaluate NK function consisted of peripheral venous blood collected from subjects between 5:30 and 7:00 pm. Samples were collected in heparin tubes (Vacutainer-sodium Heparin, Becton-Dickinson, Rutherford, NJ), tubes with ethylenediaminetetraacetic acid (EDTA) and red top tubes (Vacutainer, Becton-Dickinson, Rutherford, NJ). EDTA samples were collected for complete blood counts as heparinized blood is not optimal for use with automated hematology cell counters. Blood samples were processed within 24 hours of obtaining the sample. Samples collected in red top tubes were used for serum assays. Therefore, they were allowed to clot at 23 °C for 30 min. The serum was separated from the clot and stored at —20°C until use. As described in Ironson et al., 1990, our laboratory has effectively used whole blood assays for lymphocyte surface marker determination, proliferation to two mitogens and for natural killer cell cytotoxicity. The advantages of using whole blood procedures for these assays include: 1) the need of only 3 to 4 ml. of blood; 2) the ease of comparing functional tests and number of cells; and 3) a greater resemblance to in vivo conditions when compared to alternative methods such as density gradient separation, which change the distribution of cellular and humoral components. Determination of the distribution of lymphocyte phenotypes was done with a single laser flow cytometer (EPICS Elite, Coulter Instruments Laboratories, Hialeah, FL). The NKH.l-PE (CD56) pair of fluorescence was used to define the entire pool of mononuclear cells with NK activity (Hercend, et al., 1985 as cited by Ironson et al., 1997) and the CD3+ and CD3-CD56+ cells. Isotypic controls are mouse IgGl, IgG2, or IgM (Coulter Immunology, Hialeah, FL). Blood samples and antibodies were mixed and incubated for 10 minutes at 23° C. After lysing and washing the erythrocytes, samples were run on the

cytometer in order to quantify percent positive cells by direct immunofluorescence. A 488 nm laser line was used.

Our study used the same methods explained in Ironson et al., (1997) regarding the measurement of CD56 cells:

> The NKH.1+ (or CD56) cells were measured in a large bitmap encompassing the lymphocyte and monocyte area of the forward angle light scatter vs. 90° light scatter histogram. The QuadStat software (Coulter Epics) was used to determine the percentage of positively stained cells for marker pairs. Peripheral lymphocyte counts were calculated by multiplying the total white blood cell count and percentage of lymphocytes as determined from a Coulter MaxM automated hematology instrument. Estimates of absolute numbers of the lymphocyte or mononuclear cell populations positive for the respective surface markers were determined by multiplying peripheral lymphocyte or mononuclear cell counts by percentage positive cells for each surface marker. (p. 131)

Natural Killer cell function was evaluated by determining cytotoxicity using the whole blood chromium release assay. The target cell line utilized was the NK sensitive erythroleukemic K562 cell line. The target was done in triplicate, at 4:1 effector to target cell ratios. Incubation lasted 4-hours. The amount of $_{51}Cr$ released at the four effector to target ratios was used to determine the percent of target cells killed. Percent cytotoxicity was expressed as the ratio of the percent of target cells killed and the number of CD56+cells per unit of blood at the target to effector cell ratio of 1:1 as outlined in detail in Ironson, LaPerriere, Antoni, Klimas, and Fletcher (1990).

Chapter 3

Aims and Hypothesis

Independent Variables (predictors)	*Dependent Variables (outcomes)*
External Comfort at session 9	BF measured by PTGI
Change in External Comfort	NK cell cytotoxicity (NKCC)
Cortisol Change at session 9	Urinary Cortisol
	Depression CESD

AIM I

To identify the relationship between external comfort at session 9 and outcome measures: benefit finding, depression, natural killer cell cytotoxicity, and urinary cortisol.

Hypothesis 1.1. We hypothesize that there is a relationship between external comfort at session 9 and benefit finding. More specifically,

a. We hypothesize that external comfort at session 9 is positively related to total benefit-finding scores 12 weeks after enrollment in the study (follow-up).

b. We hypothesize that external comfort at session 9 is positively related to Factor 1 Relating to Others benefit-finding scores at follow-up.

c. We hypothesize that external comfort at session 9 is positively related to Factor 2 New Possibilities benefit-finding scores at follow-up.

d. We hypothesize that external comfort at session 9 is positively related to Factor 3 Personal Strength benefit-finding scores at follow-up.

e. We hypothesize that external comfort at session 9 is positively related to Factor 4 Spiritual Change benefit-finding scores at follow-up.

f. We hypothesize that external comfort at session 9 is positively related to Factor 5 Appreciation of Life benefit-finding scores at follow-up.

Hypothesis 1.2. We hypothesize that there is a relationship between external comfort and depression. More specifically, that External comfort at session 9 is negatively related to depression scores at follow-up.

Hypothesis 1.3. We hypothesize that there is a relationship between external comfort and NKCC. More specifically,

a. We hypothesize that External comfort at session 9 is positively related to NKCC percentage at follow-up.

b. We hypothesize that External comfort at session 9 is positively related to NKCC isotype at follow-up.

c. We hypothesize that External comfort at session 9 is positively related to NKCC activity at follow-up.

Hypothesis 1.4. We hypothesize that there is a relationship between external comfort and urinary cortisol. More specifically, we hypothesize that external comfort at session 9 is negatively related to urinary cortisol at follow-up.

AIM II

To identify the relationship between change in external comfort throughout the 10-week intervention, measured as the difference in EC scores between session 9 and session 2, and outcome measures: benefit finding, depression, natural killer cell cytotoxicity, and urinary cortisol.

Hypothesis 2.1. We hypothesize that change in external comfort throughout the 10-week intervention, measured as the difference in EC scores between session 9 and session

2, is related to change in benefit finding scores at follow-up. In general, we believe that consistently high levels of external comfort will be related to an increase in benefit finding scores. The specific hypotheses are as follows:

a. We hypothesize that consistently high scores in external comfort throughout the 10-week intervention, measured as the difference in EC scores between session 9 and session 2, are positively related to change in total benefit-finding scores at follow-up.

b. We hypothesize that consistently high scores in external comfort throughout the 10-week intervention, measured as the difference in EC scores between session 9 and session 2, are positively related to change in Factor 1 Relating to Others benefit-finding at follow-up.

c. We hypothesize that consistently high scores in external comfort throughout the 10-week intervention, measured as the difference in EC scores between session 9 and session 2, are positively related to change in Factor 2 New Possibilities benefit-finding scores at follow-up.

d. We hypothesize that consistently high scores in external comfort throughout the 10-week intervention, measured as the difference in EC scores between session 9 and session 2, are positively related to change in Factor 3 Personal Strength benefit-finding scores at follow-up.

e. We hypothesize that consistently high scores in external comfort throughout the 10-week intervention, measured as the difference in EC scores between session 9 and session 2, are positively related to change in Factor 4 Spiritual Change benefit-finding scores at follow-up.

f. We hypothesize that consistently high scores in external comfort throughout the 10-week intervention, measured as the difference in EC scores between session 9 and session 2,are positively related to change in Factor 5 Appreciation of Life benefit-finding scores at follow-up.

Hypothesis 2.2. We hypothesize that consistently high scores in external comfort throughout the 10-week intervention, measured as the difference in EC scores between session 9 and session 2, are positively related to change in depression scores at follow-up.

Hypothesis 2.3. We hypothesize that consistently high scores in external comfort throughout the 10-week intervention, measured as the difference in EC scores between session 9 and session 2, are positively related to change in NKCC at follow-up. The specific hypotheses are as follows:

a. We hypothesize that consistently high scores in external comfort, measured as the difference in EC scores between session 9 and session 2, are positively related to NKCC percentage at follow-up.

b. We hypothesize that consistently high scores in external comfort, measured as the difference in EC scores between session 9 and session 2, are positively related to NKCC isotype at follow-up.

c. We hypothesize that consistently high scores in external comfort, measured as the difference in EC scores between session 9 and session 2, are positively related to NKCC activity at follow-up.

Hypothesis 2.4. We hypothesize that consistently high scores in external comfort throughout the 10-week intervention, measured as the difference in EC scores between session 9 and session 2, are positively related to change in urinary cortisol at follow-up.

AIM III

To identify the relationship between change in salivary cortisol within session 9 and outcome measures: benefit finding, depression, natural killer cell cytotoxicity, and urinary cortisol.

Hypothesis 3.1. We hypothesize that decrease in salivary cortisol at session 9, is related to change in benefit finding scores at follow-up. More specifically,

a. We hypothesize that decrease in salivary cortisol within session 9, is related to increase in total benefit-finding scores at follow-up.

b. We hypothesize that decrease in salivary cortisol within session 9, is related to increase in Factor 1 Relating to Others benefit-finding at follow-up.

c. We hypothesize that decrease in salivary cortisol within session 9, is related to increase in Factor 2 New Possibilities benefit-finding scores at follow-up.

d. We hypothesize that decrease in salivary cortisol within session 9, is related to increase in Factor 3 Personal Strength benefit-finding scores at follow-up.

e. We hypothesize that decrease in salivary cortisol within session 9, is related to increase in Factor 4 Spiritual Change benefit-finding scores at follow-up.

f. We hypothesize that decrease in salivary cortisol within session 9, is related to increase in Factor 5 Appreciation of Life benefit-finding scores at follow-up.

Hypothesis 3.2. We hypothesize that decrease in salivary cortisol within session 9 is related to decrease in depression scores at follow-up.

Hypothesis 3.3. We hypothesize that decrease in salivary cortisol within session 9 is related to change in NKCC at follow-up. More specifically,

a. We hypothesize that decrease in salivary cortisol within session 9 is related to increased NKCC percentage at follow-up.

b. We hypothesize that decrease in salivary cortisol within session 9 is related to increased NKCC isotype at follow-up.

c. We hypothesize that decrease in salivary cortisol within session 9 is related to increased NKCC activity at follow-up.

Hypothesis 3.4. We hypothesize that decrease in salivary cortisol within session 9 is related to decrease in urinary cortisol at follow-up.

AIM IV

To identify if salivary cortisol change within session 9 mediates the relationship between external comfort at session 9 and outcome measures: benefit finding, depression, NKCC, and urinary cortisol.

Chapter 4

Statistical Analyses

Preliminary Analyses

Prior to analysis, control variables, dependent variables and independent variables were examined through SPSS FREQUENCIES, SPSS EXPLORE AND SPSS DESCRIPTIVES for accuracy of data entry, missing values, and fit between their distributions and the assumptions of statistical tests. Missing values ranged from 2.9% to 52.2% for the analyses. Reasons for missing data included: missed appointments by participants, extended times between sample collection and analysis that rendered the samples not suitable for analyses, and random lab errors (malfunctioning of laboratory equipment). Chi-square tests and analysis of variance indicated that participants who missed appointments did not differ from those who did not miss appointments on any of the variables. Given this information, missing values were determined to be missing at random and were deleted listwise for both preliminary and all subsequent analyses. Nonetheless, other than participants having attended at least one group session, attendance to intervention sessions was not evaluated in these analyses. To improve pairwise linearity and to reduce extreme values of skewness and kurtosis external comfort was transformed using its inverse (inverse transformation does not affect directionality of the relationship for the interpretation of results), salivary cortisol values were logarithmically transformed and number of positive lymph nodes was transformed by square root. The dichotomous control variable "positive lymph nodes tested" was deleted from analysis because its poor split truncated its correlations with other variables. Five cases with extreme values on external comfort, salivary cortisol and factors III and IV of

benefit finding were found to be univariate outliers. Two of those cases were also found to be multivariate outliers through Mahalanobis distance with p >.001. All five outliers were deleted, leaving 51 cases for analyses.

In 2004, Ironson, Henderson-Lally, Durán, Weiss and Antoni, used data from the same trial as the current study to evaluate intervention effects. Their sample included the same participants from our intervention sample plus the participants assigned to the control condition. They found significant intervention effects for CESD, Urinary Cortisol, PTGI and indicators of immune function when comparing intervention vs. control subjects. In order to determine significant change from baseline to follow-up we performed paired t-test analyses on the current intervention sample. Results indicated a significant positive change for Total PTGI score, PTGI Factor I Relating to Others, PTGI Factor II New Possibilites, PTGI Factor III Personal Strength, PTGI Factor IV Personal Strength, and External Comfort from Session 2 to Session 9. In addition, a significant decrease was also evidenced for change in CESD and change in salivary cortisol within session 9. Change in indicators of immune function, urinary cortisol and PTGI Factor V Appreciation of Life were not significant (Table 1).

Control Variables

Initial inclusion of control variables in the regression models was theoretically driven and later statistically defined. Control variables for benefit finding were selected as those that have been described in the literature as having significant relationships with this dependent variable for cancer patients. For the benefit finding analyses, control variables included age (Cordova et al., 2001; Lechner et al., 2003; Manne et al., 2004; and Weiss, 2004), level of education (Urcuyo, Boyers, Carver, & Antoni, 2005; Widows, Jacobsen,

Booth-Jones & Fields, 2005), income (Kinsinger et al., 2006), ethnicity (Kinsinger et al., 2006; Urcuyo et al., 2005), stage of cancer (Lechner et al., 2003; Tomich & Helgeson, 2004) and the use of anti-estrogen medication (Urcuyo et al., 2005). For depression and biological variables, sociodemographic control variables included age (years), ethnicity (Caucasian, African American, Hispanic, Others), marital status (single/never married, married or in an equivalent relationship, separated, divorced and widowed), income (thousand dollars per year), and education (years). Disease related variables included stage of cancer, time since diagnosis (months), time since end of treatment (months), number of positive lymph nodes, menopausal state (yes or no), use of estrogen blockers (yes or no), chemotherapy (yes or no) and radiation (yes or no) (Bloom et al., 2001; Deshields, Tibbs, Fan & Taylor, 2006; Morasso et al., 2001; Wong-Kin & Bloom, 2005). These variables were evaluated to determine if they were significantly correlated with the dependent variables. The significance level was established at .10 to test the correlations between dependent and continuous control variables. Categorical control variables were tested in linear regression models, using dummy coding. Significance of the model was also set at $p < .10$. Control variables that were significantly related to the dependent variables were later tested in a regression framework. If the variable improved the model fit, it was kept in the model for further analyses. If the variable did not improve the model fit, it was evaluated to determine if it was necessary to keep it in the model. None of the identified control variables were related to the dependent variables, and were not included in subsequent analyses.

Dependent and Independent Variables.

Total PTGI scores, and CESD scores were computed by adding reported scores on all items of the measure. Items for each one of the PTGI factors and ranges are listed in Appendix V. Because a 24 hour sample urinary sample was not used, it was important to correct for hydration status. Therefore, urinary cortisol was corrected by creatinine by dividing urinary hormone concentration by urinary creatinine (Masi, Ricket, Hawkley & Cacciopo, 2004).

The measurement of change in clinical research has been the subject of numerous discussions and controversy (Gardner & Neufeld, 1987; Raykov, 1999). Choosing the ideal way of measuring change in an experimental design is a meticulous process that requires consideration of many factors including the nature of the research question, number of variables, sample size, and even missing data. The current study considered several statistical methods in order to answer the proposed research questions. Structural equation modeling was originally considered to evaluate change as a latent variable. However, our sample size and the number of variables in our research limited the utilization of this method. In our previous research, we used a hierarchical linear model (HLM) to study the relationships between in-session variables and outcomes on the same sample of women. HLM is the most appropriate tool for analysis of data where there are three or more observations that are nested within individuals. Furthermore, it facilitates analysis when the numbers of observations vary across cases. (Raudenbush & Byrk, 2002). For our present study, correlational analyses on simple gain scores appeared to be most appropriate method as calculations were based on only two time points, missing data was significant and the number of variables was high.

The use of change scores has created much controversy as it has been argued that they are often unreliable and less powerful than other analyses (Cronbach & Furby, 1970; Lord, 1956). Gardner and Neufeld (1987) state that despite the intuitive appeal of simple change scores, there are three particularly hazardous aspects to using them: the negative correlation of the pretest score and the change score, the low reliability of the change score and the difficulties in interpreting results of change score analyses. The first one is of particular interest when evaluating the effects of an intervention. For the purpose of this study, we have chosen variables in which the intervention effects have already been assessed through other methods (Ironson, et al., 2004) and, therefore, this concern is of little relevance for our current analyses.

As per the low reliability of the difference score, Rogosa, Brandt and Zimowski (1982) demonstrated that a low coefficient of reliability can be due to a restricted range in the difference scores and does not necessarily reflect that the scores are unreliable. In fact, they state that in randomized studies, difference scores reflect true change in a reliable manner while accounting for individual growth in the analyses (Rogosa & Willet, 1983).

The difficulties in the interpretation of change scores were addressed by Bereiter (1963) and by Linn and Slinde (1977). Their observations are mostly concerned with interpreting test-retest scores when there is a given level of uncertainty as to whether one is measuring the same aspects on both measurement occasions. On this point, Gardner and Neufeld argue that "the difference score is itself meaningful to the extent that it is viewed as an index of the true difference between two assessments" (p. 851).

For the purpose of these analyses we also considered using residualized change scores. However, we decided not to because our data for session 9 indicated a ceiling effect, violating the homogeneity of variance assumption. .Having discussed the value and utility of gain scores, change in benefit finding, depression and biological measures was computed as a difference score between the value twelve weeks after the initial assessment and the value at baseline.

Statistical Analyses for AIMS I, II and III. Pearson correlation coefficients were calculated between all variables of interest to explore relationships. Linear regression models were created to explore relationships between dependent and independent variables.

Statistical Analyses for AIM IV. Originally planned to be tested through Baron and Kenny's mediational model (1986), these analyses were not performed as results did not meet the necessary criteria to establish mediation.

Chapter 5

Results

Sample Composition

The sample for this study was taken from participants in a larger study of 125 women who had completed treatment for breast cancer. The analyses were performed only on women assigned to the intervention condition, who attended at least one intervention session and had completed the post-intervention assessment at 12 weeks after baseline. This included 56 women. Due to listwise deletion the number of valid data for the different sets of analyses varied from 12 as the lowest number of valid data for NK cell analyses to 39 as the highest for PTGI analyses.

Demographics

The mean age of the sample at baseline was 50.1 (SD = 8.30). The sample was highly educated with a mean of 14.8 (SD = 2.96) years of education. The mean income for the sample was 65.12 thousand dollars per year (SD = 54.64) and 58.8% of the sample was employed full or part time. Sixty three percent of the sample was married, 4.7% was separated, 12.5% was divorced, 16% was single and 1.6% was widowed. Sixty eight percent of the sample had children. As per ethnicity, 53.1 % was Caucasian, 25% Hispanic, and 6.3% African American. Table 2 summarizes demographic data.

Regarding disease and treatment variables for the overall sample, 80% of the participants had been diagnosed with Stage I or II cancer, on an average of 12 months before baseline. Over fifty percent of the sample had undergone a lumpectomy and 40 % unilateral mastectomy. Radiation therapy had been received by 64.1 % of the sample and 59.4 % had undergone chemotherapy. The mean time elapsed since participants had

ended treatment (surgery, chemotherapy and radiation) was 5.1 months. Table 3 summarizes disease and treatment variables for the sample.

Descriptives

The mean score for external comfort at Session 2 (EC2) was 21.02 (SD = 2.97) increasing to 23.55 for session 9 (EC9) (SD = 1.01) (possible range 4 to 24). Figures 1 and 2 illustrate frequency distributions for EC2 and EC9, respectively. The mean for change in external comfort was 2.29 points (SD = 2.67). Salivary cortisol in session 9 had a mean change score of -.031 µg/dl (SD = .069). Baseline, follow-up and mean scores for change in dependent variables are summarized in Table 4. Mean change scores for dependent variables indicate a positive change for Total PTGI and Factor I, II, II and V, and NKCC indicators, and a negative change for PTGI Factor IV, CESD score and Urinary Cortisol. Baseline, follow-up and mean scores for change in independent variables are summarized in Table 5. Table 6 summarizes correlations between dependent and independent variables.

AIM I. *External Comfort at Session 9.* In a total of eleven standard linear regressions, external comfort at session 9 was used to predict six dependent variables representing change (follow-up – baseline) in benefit finding: change in total PTGI scores, and change in each one of the five PTGI factors (Factor I Relating to Others, Factor II New Possibilities, Factor III Personal Strength, Factor IV Spiritual Change, and Factor V Appreciation of Life), change in CESD (follow-up – baseline), change in NKCC activity, isotype and percentage (follow-up – baseline), and change in urinary cortisol (follow-up – baseline). Table 7 displays regression coefficients, intercepts, standardized regression coefficients, coefficients of determination (r2), degrees of

freedom and statistical significance for the regression models. External comfort at session 9 was not significantly related to any of the outcome measures. Although, a positive trend was present for a significant relationship between external comfort at session 9 and total percent of Total Percent of NK cells (p = .056), these results are not statistically significant as preliminary paired t-test analysis indicated a non-significant change in Total Percent of NK cells.

AIM II. *Change in External Comfort*. In a total of eleven standard linear regressions, change in external comfort from session 2 to session 9 (calculated as session 9 score minus session 2 score) was used to predict six dependent variables representing change (follow-up – baseline) in benefit finding: change in total PTGI scores, and change in each one of the five PTGI factors (Factor I Relating to Others, Factor II New Possibilities, Factor III Personal Strength, Factor IV Spiritual Change, and Factor V Appreciation of Life), change in CESD (follow-up – baseline), change (follow-up – baseline) in NKCC activity, isotype and percentage and change (follow-up – baseline) in urinary cortisol. Table 8 displays regression coefficients, intercepts, standardized regression coefficients, coefficients of determination (r2), degrees of freedom and statistical significance for the regression models. Change in external comfort from session 2 to session 9 was a significant predictor for Change in Total PTGI (p = .011), and Change in PTGI Factor 1 Relating to Others (p = .021). A trend was present for a relationship between Change in External Comfort and Change in Factor II New Possibilities (p = .077). Preliminary paired t-test analyses had rendered change in Factor V Appreciation of Life and Total Percent of NK cells non-significant. Therefore significant p's in the regression models for these variables do not indicate statistically significant relationships. Change in external

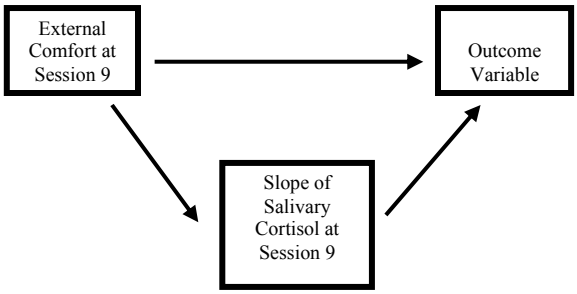
comfort from session 2 to session 9 was not significantly related to any other outcome variables.

AIM III. *Change in Salivary Cortisol Session 9.* In a total of eleven standard linear regressions, change in salivary cortisol within session 9 was used to predict six dependent variables representing change (follow-up – baseline) in benefit finding: change in total PTGI scores, and change in each one of the five PTGI factors (Factor I Relating to Others, Factor II New Possibilities, Factor III Personal Strength, Factor IV Spiritual Change, and Factor V Appreciation of Life), change in CESD (follow-up – baseline), change (follow-up – baseline) in NKCC activity, isotype and percentage and change (follow-up – baseline) in urinary cortisol. Table 9 displays regression coefficients, intercepts, standardized regression coefficients, coefficients of determination (r2), degrees of freedom and statistical significance for the regression models. Change in salivary cortisol within session 9 was not significantly related to any of the outcome variables.

AIM IV. *Change of Salivary Cortisol as a Mediator*. In order to test mediation of cortisol change on the relationship between external comfort and outcome measures the Baron and Kenny's mediation model (1986) was used. This model would prove mediation only if the following criteria were met:

1. There must be a significant relationship between external comfort at session 9 and outcome measure.
2. External Comfort must be a predictor of change in cortisol for session 9.
3. Slope of salivary cortisol at session 9 must be a predictor of the outcome variable.

Mediation would have been established if and when the relationship between external comfort at session 9 and outcome measures was initially significant but became non-significant when controlling for the slope of cortisol at session 9. However, since the third criterion was not met, the mediation model was not applicable and therefore was not tested.



Secondary Analyses. The results discussed above appeared to be counterintuitive as they showed significant negative correlations between change in external comfort and some of the outcome variables. The negative sign indicates that an increase in change in external comfort is negatively related to an increase in change in the outcome variable and is not indicative of the direction of change of the variable throughout the intervention. For example, the case of Total PTGI, its mean change score (calculated as follow-up score minus baseline score) was 3.33 (SD 11.78). The predictor, change in external comfort (calculated as session 9 score minus session 2 score) also experienced a positive change throughout the intervention. A negative relationship between these two variables indicates that as external comfort increases throughout the intervention there would be less change in Total PTGI (Total PTGI would increase less). As another example the relationship between CESD and Change in EC was not significant result. However a closer examination could help clarify the relationships between variables.

CESD is a variable that decreased from baseline to follow up with a mean change score of -1.87 (SD= 6.79). A negative relationship between change in external comfort and CESD would indicate that as external comfort increases throughout the intervention, there would be less change in depression scores (CESD would decrease less).

In order to clarify the direction of the relationship between change in External Comfort and Benefit Finding, a median split on Change in External Comfort (Session 9 minus Session 2) was performed on the sample, thus rendering a group that had reported little or no change on External Comfort throughout the intervention (Group 1) and a group that had reported the most change on External Comfort throughout the intervention (Group 2). Stated differently, and remembering that most participants reported high levels of comfort at the end of the intervention, Group 1 represents individuals who reported high levels of external comfort early in the intervention and maintained those levels throughout, thus experiencing little change in external comfort. Group 2 represents individuals who reported lower levels of comfort early in the intervention and progressively increased their comfort levels towards the end, thus experiencing greater change in external comfort (Figure 3). Table 10 summarizes the means and standard deviations per PTGI factor for each of the groups. Graphs were generated representing the change in means for each group for the independent variable and for those variables that showed significant relationships with Change in External Comfort. Figure 4 represents the change in external comfort means from session 2 to session 9 for both groups. Figures 5, 6, 7 and 8 represent Change (score 2 weeks after the intervention minus score at baseline) in means of Total PTGI, Factor I, Factor II and Factor V respectively, from baseline to after the intervention.

Chapter 6

Discussion

The purpose of this study was to determine if a particular aspect of group process, mainly how comfortable participants feel in a group, is related to outcomes of a stress management cognitive behavioral intervention for women who have completed treatment for breast cancer. In previous research on the same sample, we had determined that by session 9 of a 10 week CBSM intervention, external comfort was a significant predictor of change in salivary cortisol, but did not predict mood or relaxation ratings as it had done for earlier sessions (Morillo, 2004). Salivary cortisol, mood, and relaxation ratings were chosen as outcome variables for that previous study as they provided information on the short term effectiveness of each session. For the present study we sought to determine if external comfort continued to be related to outcomes after the intervention had ended. Outcomes for this study included, an indicator of positive states of mind (PTGI), an indicator of negative states of mind (CESD) and two biological outcomes (NKCC and Urinary Cortisol). As it has been considered that group process is a dynamic entity, we also evaluated whether change in external comfort, from beginning to end of the intervention, was related to outcome. Finally, as our previous research had found a significant change in salivary cortisol during session 9, we intended to evaluate if this change was related to outcome on a longer term basis. Discussion of results by independent variables follows.

External Comfort at Session 9.

Contrary to what we anticipated, external comfort at session 9 was not related to any psychosocial or biological outcome measures. Although a marginally significant

relationship was present in the regression analysis between external comfort at session 9 and Change in Total Percent of NK cells, preliminary t-test analyses rendered these results non-significant for this intervention sample. In 2004, Morillo's study found a significant relationship between external comfort at session 9 and salivary cortisol, such that higher levels of external comfort during session 9 were significantly related to lower levels of within session salivary cortisol. Those results, coupled with the incipient knowledge about the effects of group cohesion throughout time within group therapy, triggered the current study's hypothesis that late cohesion would be related to outcome. However, given the current findings, it is likely that the significant relationship between external comfort at session 9 and the decline in salivary cortisol evidenced in Morillo (2004) study represented only a within session phenomenon. Similarly to Morillo, 2004, a study by van Andel, Erdman, Karsdorp, Appels and Trijsburg (2003) also established a short term relationship between a measure of group cohesion and a biological marker. In their study, van Andel et al. (2003) evaluated the outcome of a CBSM intervention for 42 cardiac patients. The measure used for cohesion was a newly developed measure, the Group Cohesion Questionnaire (GCQ). The GCQ defines cohesion mainly from the member-to-member and member-to-group perspectives. Although the main factor in this questionnaire is that of "attraction to the group" it also evaluates feeling accepted in the group and feeling close to others, making the measure akin to the concept of relatedness. van Andel et al., (2003) found that member to member relationships were predictive of systolic and diastolic blood pressure and speculated that feeling close to others enhances a feeling of safety within the group that promotes benefit from the relaxation exercises. In other words, people who feel more comfortable in the group may be able to achieve

higher relaxation ratings, and this is reflected in biological measures such as blood pressure (as in the van Andel 2003 study) or salivary cortisol levels (as in Morillo's 2004 results). These findings support the short-term effects of cohesion on outcome perhaps via a regulating effect of social support (from group members) on the HPA axis (Turner-Cobb, et al., 2000). Our current results do not support the effects of late cohesion on long-term outcome. One explanation may be that the effects of late cohesion are a short term phenomenon limited to within session outcomes such as a transient regulation of the HPA axis. It may also be the case that early cohesion (and not late cohesion) is better related to outcome (Taft et al. 2003; Tschuschke & Dies, 1994; Yalom & Rand, 1996). Finally, it is important to underline that failure to find significant results may be due to a lack of variability at that particular timepoint in the external comfort measure. The mean of external comfort for session 9 was 23.55 with the high end of the range being 24; this may indicate reaching of a ceiling in the measure (Figure 8).

Change in External Comfort from Session 2 to Session 9.

Initial evaluation of change in external comfort in the current sample was performed in a previous study (Morillo, 2004) that indicated a steady increase in external comfort from beginning to end of the intervention through hierarchical linear modeling. The current study also found a significant increase in external comfort through a change score calculated as session 9 score minus session 2 score. Because the current study used regression models where a change score was used to predict another change score, interpretation of results is not straightforward and requires a two step process.

First, we identify those relationships with outcome variables that showed a significant increase within the intervention group. This is done with paired t-test analyses

from baseline to follow-up within this group. These analyses must render a significant change for that particular variable in order for results to be interpretable. Therefore, although regression analyses proved significant for 1) change in external comfort and Factor V Appreciation of Life and 2) change in external comfort and Total Percent NK, these results cannot be interpreted because the paired t-test analyses on these outcome variables indicated that there was no significant change from baseline to follow-up. The only interpretable findings are that Change in External Comfort was significantly related to Total PTGI scores, and PTGI Factor I Relating to Others. The relationship between change in EC and PTGI Factor II New Possibilities was marginally significant and further research should address this finding in a larger sample. Contrary to expectations, Change in External Comfort was not significantly related to any other outcome variables.

Next, to correctly interpret the findings of this study, careful attention must be paid to the direction of the relationship expressed by beta weights. Beta weights for the relationships between Change in External Comfort and Change in PTGI variables were negative. This indicates that as External Comfort increases, PTGI variables change less, that is, increase less at follow-up. Since the mean for External Comfort in Session 9 was 23.55 (with the high end of the range being 24), change would have only occurred for those individuals with lower initial scores in External Comfort. Therefore, we could interpret these findings to suggest that participants who maintained consistently high levels of External Comfort experienced an increase in benefit-finding. In turn, those participants who had lower initial levels of comfort (despite the fact that they increased towards the end of the intervention), experienced less increase in benefit finding at follow-up.

In order to clarify these relationships, secondary analyses by median split of change in EC from session 2 to session 9 and evaluation of graphs by groups (Figures 5, 6 and 7) illustrated the same pattern of change for all variables. Participants who experienced little change in external comfort throughout the intervention, which corresponds to higher initial levels of external comfort, also experienced an increase in Total PTGI score, Factor I Relating to Others and Factor II New Possibilities, by the follow-up assessment. Thus, it may be the case that the longer it takes for a participant to feel comfortable within the group setting, the less the participant is able to realize benefits from their experience with breast cancer. These findings suggest that external comfort scores at session 2 may be better predictors of outcome than the late indicators of cohesion chosen for the current study.

Several other researchers have suggested that cohesion may vary across time (Grabhorn, et al., 2002; van Andel et al., 2003) and that perhaps an early indicator of cohesion may be most related to outcome (MacKenzie & Tschuschke, 1993, Taft, et al., 2003). MacKenzie and Tschuschke's (1993) suggested that relatedness could reflect a motivational/attitudinal set present in individual participants prior to beginning therapy, rather than a property of the group itself. They state that individuals with a greater capacity to relate to others do better in-group. Careful examination of our current results may support this assertion. Figure 5 illustrated that participants in the group with greater change in external comfort (which includes participants with lower levels of cohesion at the beginning of our intervention study, as illustrated in Figure 4), also experienced less positive change in their PTGI scores. In turn, participants in the group with less change in external comfort (which includes those participants who experienced high levels of

comfort throughout the intervention) experienced positive change in their total PTGI scores. In other words, participants who felt less safe, comfortable, understood and close to others at the beginning of the intervention were also less likely to find benefit in their experience with cancer at the end of the intervention. Tedeschi and Calhoun (1996) have suggested that post-traumatic growth in group settings may occur after modeling other participants or talking about the experience in a safe setting that promotes re-evaluation and reframing. In addition, Tschuschke and Dies (1994) found that high and positive emotional relatedness to other members of the group promotes self-disclosure and leads to more feedback from other members. Therefore, it is possible that participants with low initial levels of external comfort, felt less compelled to self-disclose, and in doing so had less opportunity to share their experience, re-evaluate and reframe. Furthermore, it is possible that participants with lower initial levels of external comfort had to work harder at establishing interpersonal relationships rendering other therapeutic processes as secondary.

To our knowledge there are four previous studies that used the relatedness measure - or factors derived from this measure - to evaluate change in cohesion within a group therapy setting and its relationship to outcome (Grabhorn et al., 2002; MacKenzie & Tschuschke, 1993; Morillo, 2004; Tschuschke & Dies, 1994). All of these studies found a significant increase in cohesion throughout the course of therapy and a significant positive association between relatedness and outcomes of these interventions. When thinking about group therapy and the necessary elements for it to be successful, it may be necessary to focus on aspects of cohesion such as feeling comfortable in a group, feeling understood, feeling safe, close to others. These aspects of cohesion (summarized as

support and acceptance by Bloch and Crouch, 1985) conceptualized in our current study as the socio-emotional characteristics of cohesion may be paramount to disclosure of emotions and a perception of social support that may facilitate processing of information during group sessions.

A general examination of the results from the aforementioned studies also highlights the possible universality of the concept of cohesion in terms of types of group psychotherapy. The studies by Grabhorn et al., 2002; MacKenzie & Tschuschke, and Tschuschke & Dies, 1994 included inpatient participants with a variety of psychological disorders including, but not limited to, eating disorders, depression, anxiety, and personality disorders. Our current study adds to the pool of information as it includes both a clinical population (i.e., breast cancer patients) and a cognitive behavioral therapy setting. Thus our findings suggest that the effects of cohesion may be generalized to different types of group psychotherapy and to both clinical and health populations. In fact, three other studies (using different measures of cohesion) have separately reported significant relationships between cohesion and outcome for breast cancer patients and cohesion and outcome for cognitive behavioral therapy.

As per a study linking cohesion to outcome in midst of a cognitive behavioral therapy setting, Taube-Schiff et al. (2007) reported that an increase in group cohesion among 34 patients with social phobia was significantly related to reduction of symptoms of social anxiety. These researchers underline the importance of social interactions for this particular population and sustain that the socio-emotional aspects of cohesion may have the most impact on outcome for this particular clinical population.

Regarding group cohesion and breast cancer, Andersen et al. (2007) studied the effects of group cohesion in a sample of 106 breast cancer patients assigned to a biobehavioral intervention. In their study cohesion was evaluated by a score comprised of two items on a 10 point Likert scale "How involved did you become in this group experience?" and "How supported by this group did you feel?" In contrast to our study, cohesion was evaluated at a single timepoint after 18 weekly sessions. Their results indicated that cohesion covaried with change in behavioral, psychological and health areas. Moreover, they found long term effects of cohesion on outcomes (up to 12 months) and that the effects of cohesion were independent of the practice of treatment techniques.

These last findings are particularly relevant as it may be posed as an explanation for the effects of cohesion that participants who feel more comfortable in the group are therefore more involved, attend more sessions, acquire better skills in group and are more likely to practice the techniques taught in group and/or to complete homework. Unfortunately, our current study cannot contribute to answering that question. For the purpose of this analysis, we did not include measures of attendance, skill acquisition, homework completion or practice. However, these data are available in the context of the larger trial. Considering that our current findings may be a proxy for the aforementioned variables we suggest that these important domains be the target of future directions for research.

May et al. (2008) also found significant results linking cohesion to outcome for cancer populations, albeit their measure of cohesion (GCQ-22) tapped into additional constructs different from the socio-emotional aspects that our study emphasized. Interestingly, they found that the cooperation aspect of cohesion had a significant positive

relationship with quality of life and physical functioning in women. In the case of this study where the intervention was a physical rehabilitation program, the conceptualization of cohesion may relate better to that of cohesion in sports psychology. When performing physical activity together, aspects such as cooperation may contribute better to outcome than the socio-emotional characteristics of cohesion necessary for psychotherapy groups. In fact, directions for future research may be to elucidate the different aspects of cohesion that are relevant not only for the type of therapeutic intervention but also for the characteristics of the population. The socio-emotional aspects of cohesion may be particularly important in the development of benefit finding for breast cancer patients who are trying to leave the "battle against cancer" and regain some normalcy in their lives. Feeling supported, understood, safe and close to others might be a necessary pre-condition for these patients to discuss their feelings, fears and thoughts in a receptive environment and thus find meaning in their experience and be able to grow from it.

Studies that have not found a relationship between cohesion and outcome include Teasdale et al., 1977; Woody and Adessky, 2002; and Lorentzen, 2008. In discussing their results, Woody and Adessky, (2002) suggest that in their highly structured environment of CBGT for social phobia, participants may find fewer opportunities to engage with each other than in less structured groups. Thus, they believe that their findings may be due to an interference with emotional expression and disclosure.

We believe that many of the controversial findings may be due to the fact that researchers are actually tapping into different constructs that tend to relate differently to outcome. In fact, Woody and Adessky, (2002) conceptualized cohesion as "attraction to the group" whereas the concept of relatedness is more akin to "the experience of

acceptance and support in the group." (Grabhorn et al., 2002). It is possible then, that attraction to the group as evaluated by items such as, "If I were told my group was not going to meet today I would feel bad" relates differently to outcome than "In today's group I feel understood/misunderstood".[1] In fact, when van Andel et al., 2003 added items addressing feelings of acceptance and closeness to other members to the same measure used by Woody and Adessky (2002), they found that cohesion was significantly related to outcome of a cognitive behavioral intervention for cardiac patients.

Results in Teasdale's study (1977) - a replication of Hand et al., 1974- indicate that overall their groups developed lower levels of cohesion than those reported by Hand and his colleagues, which may have affected the relationship with outcome. In their discussion, they speculate that perhaps a threshold level of cohesion is needed to impact outcome and that the threshold may not have been achieved in their study. As for Lorentzen's study (2008) their definition of cohesion does not address feelings of closeness or acceptance and is more related to feelings of commitment and compatibility to the group, which in part may explain the contrast of results.

Several other studies have reported positive relationships between outcome and cohesion, but due to the variability in definition and operationalization of the measure, we have chosen to limit our discussion to those with a definition of cohesion akin to the concept of relatedness and to studies that match our population (breast cancer patients) or type of therapy (cognitive behavioral).

[1] These examples were chosen as a simple way of illustrating differences in conceptualization among studies. We are aware that the scales used are more complex than these examples indicate.

Change in Salivary Cortisol during Session 9. Rejection of the null hypothesis for Aim III was not accomplished. Therefore, we could not establish a significant relationship between the decline of salivary cortisol during session 9 of the intervention and other outcome measures. However, a significant decline of salivary cortisol within session 9 was still evidenced through paired t-test analyses. These results supported our findings from a previous study on the same sample. In Morillo (2004), we had established, through hierarchical linear modeling, a steep decline of salivary cortisol from beginning to end of session 9 of a 10 week CBSM intervention. This slope was significantly different from a flatter slope at session 2. Thus, we speculated that the significant decline in salivary cortisol levels towards the end of the intervention could impact outcome at later timepoints. In a similar study in HIV + men, Cruess et al. (2000) reported different patterns of change in cortisol levels, with a steeper drop in within session salivary cortisol occurring earlier rather than later during the intervention. We are unable to explain the differences in these findings but speculate a possible relationship to gender differences in the context of group settings.

Current results are in accordance to the nature of salivary cortisol as an indicator of short-term reactivity of the HPA axis. The steep decline in levels of salivary cortisol experienced during session 9 may be achieved through a combination of sharpening of the relaxation skills and higher levels of comfort within the group but may be unrelated to subsequent outcome changes such as regulation of urinary cortisol excretion, immune functioning and psychosocial measures.

Limitations, Future Directions and Clinical Implications

Empirical evidence has demonstrated the utility of group therapy as a way of delivering effective psychotherapy to a variety of populations. In recent years, researchers have attempted to identify the active components of group therapy in an effort to find a way to maximize the effects of group interventions. One of these active components is believed to be group cohesion. Our study evaluates an indicator of group cohesion, relatedness, and more specifically external comfort, and its relationship to outcomes of a CBSM intervention for women who have completed treatment for breast cancer. Although we were able to establish significant relationships between external comfort and several of our outcome measures, our investigation faced important limitations which must be discussed before attempting to state the conclusions to our work. Our first limitation concerns the issue of power. Our sample was affected by a large proportion of missing data that affected the power of the analyses. Admittedly, when performing a large number of analyses on a single sample, one should in turn correct for Type I error (i.e., Bonferroni correction). However, we chose to forego this process in order to preserve the limited power of our study. Our second limitation also involves sample size. Ideally, when studying a variable within a research study organized by cohorts, one would use data analytic techniques that would allow us to analyze results while accounting for cohort effects on outcomes (e.g. hierarchical linear modeling). Although HLM is an effective tool for the analysis of longitudinal data and appropriate when the number of observations varies among cases (Raudenbush & Byrk, 2002), the current study used only two time-points with a large number of variables. Therefore we chose to evaluate change scores through regression analyses and used listwise deletion

for management of missing data. Listwise deletion is the most common approach to missing values, however, it does not come without its limitations. Since our data is likely not missing completely at random, the use of listwise deletion introduces bias as the remaining sample may not be representative of the population. As a result, this bias may either exaggerate or underestimate the effects of the intervention. Therefore, interpretation of results must be done with caution.

Another limitation of this study is that we had a very small sample size for some analyses. For example, the lowest sample size in this study was N=12 for examining the relationship between Change in EC and NK cell function. With a sample size this small, one does not have adequate power to test whether a relationship really exists. Therefore, these results should also be interpreted with caution.

A third limitation involves theoretical aspects of our study. As previously discussed, our results raise the important question of whether external comfort constitutes a trait of certain individuals which allows them to feel more comfortable in the group and relate better to other participants. Having this ability may provide these individuals with the opportunity to fully engage in the psychological processes elicited in the intervention and thus to achieve more benefits from their participation. Regarding this aspect, our study is limited by the lack of information on personality traits that would allow us to evaluate whether the levels of external comfort developed in the group were a product of group process, a trait ability of each individual to relate to others, or a combination of both. Another important limitation is that our study did not include variables such as attendance, homework completion, or CBSM skill acquisition all of which could render

significant relationships both with our measure of cohesion and with our outcome variables.

Finally, the Stuttgarter-Bogen measure presents some data collection issues that require discussion. The measure (see Appendix II) consists of eight items rated on a 6 point Likert-type scale. Because of the physical appearance of the item responses, with a gap between -1 and +1 (on items with scaled scores ranging from -3 to + 3) participants thought that each item was really two items and responded to them accordingly. Therefore, the layout of the measure was carefully redesigned early on in our study and group leaders would spend extra time explaining how to properly fill out the measure. Nonetheless, it is possible that some of the missing data for group cohesion was due to confusion on the proper way to fill out the Stuttgarter-Bogen measure.

In terms of generalizability of our results, our sample consisted of mostly stage I and II, married breast cancer patients of moderate to high socioeconomic status, albeit a fair representation of minorities. Therefore, we recommend researchers exercise caution when attempting to generalize results to other cancer patients, gender, or age group as well as therapeutic groups of different nature and structure.

This study contributes to the growing literature on elements of group process, change of these elements throughout the course of therapy and their relationship to outcomes. Further research may attempt to establish the mechanisms by which higher levels of comfort within the group contribute to the development of benefit finding. Importantly, we also recommend that future research evaluate these participants' attendance, acquisition of CBSM skills, and homework/practice in an attempt to clarify their relationships to cohesion and their contribution to change in outcome variables.

It would also be of interest to evaluate the influence of personality traits on external comfort. This information would perhaps allow researchers to tailor interventions for individuals with particular sets of personality traits, in order to promote successful outcomes.

Lastly, examination of our results indicates that it is the trajectory of change in external comfort and not the late score in external comfort that is related to benefit finding. Careful examination of the median split graphs suggests the perhaps early cohesion would evidence stronger relationships with outcome. We strongly recommend that future studies utilize early session data for external comfort. This is predicated on the finding that early cohesion may better predict outcomes, as well as the greater variability we observed at this timepoint. In addition, we recommend that future researchers interested in the area of group cohesion attempt to elucidate its relationship to other theoretically and empirically proposed therapeutic factors.

Notably, the current research is the first to establish significant relationships between group cohesion and benefit finding. In this sense, this study lends supportive evidence to the notion that by fostering group cohesion in group interventions we may positively impact post traumatic growth in breast cancer patients.

As per immediate clinical implications, our study suggests that despite ignoring the underlying mechanisms by which therapeutic factors influence outcome, group therapists may find that by promoting the development of therapeutic factors such as cohesion, early in the group, they may increase positive outcomes of the intervention.

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TABLES

Table 1. Paired t-test Analyses for Change in Dependent and Independent Variables (Baseline – Follow-up)*.

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference Lower	Upper			
Pair 1	TPTGIT1 - TPTGIT2	-9.94	11.84	1.64	-13.24	-6.65	-6.055	50	.000
Pair 2	PTGI Factor I T1 Relating to Others - PTGI Factor I T2 Relating to Others	-3.62	4.79	.66	-4.95	-2.28	-5.442	50	.000
Pair 3	PTGI Factor II T1 New Possibilities - PTGI Factor II T2 New Possibilities	-3.21	3.94	.55	-4.31	-2.11	-5.874	50	.000
Pair 4	PTGI Factor III T1 Personal Strength - PTGI Factor III T2 Personal Strength	-1.77	2.71	.38	-2.52	-1.02	-4.716	50	.000
Pair 5	PTGI Factor IV T1 Spiritual Change - PTGI Factor IV T2 Spiritual Change	-1.00	2.13	.30	-1.59	-.41	-3.381	50	.001
Pair 6	PTGI Factor V T1 Appreciation of Life - PTGI Factor V T2 Appreciation of Life	-.35	2.34	.32	-1.00	.31	-1.066	50	.292
Pair 7	CES-D Total T1 - CES-D Total T2	1.96	6.87	.97	.01	3.91	2.016	49	.049
Pair 8	Total percent of CD56+ CD3- T1 - Total percent of CD56+ CD3- T2	.038	2.29	.40	-.79	.86	.093	31	.927
Pair 9	NKCC activity T1 - NKCC activity T2	-2.26	10.30	1.82	-5.98	1.45	-1.243	31	.223
Pair 10	Urinary Cort T1 - Urinary Cort T2	1.15	2.52	.43	.29	2.02	2.702	34	.011
Pair 11	Salivary cort 9 pre - Salivary cort 9 end	.039	.051	.01	.022	.06	4.486	33	.000
Pair 12	External Comfort Session 2 - External Comfort Session 9	-2.39	2.58	.43	-3.26	-1.52	-5.561	35	.000

* Means and standard deviations for all variables are given in Table 5.

Table 2. Description of Demographic Variables.

Variable	N = 51
Age (years)	50.11 (8.3)
Education (years)	14.8 (2.96)
Income (thousand dollars per year)	65.12 (54.64)
Marital Status:	
Married	63%
Separated	4.7%
Divorced	12.5%
Widowed	1.6%
Single	16%
Have children:	
Yes	68.8%
No	28.1%
Number of children:	
Between 1 and 3	81.2%
More than 3	18.9%
Ethnic Background:	
Caucasian	53.1%
African American	6.3%
Hispanic	25%
Other	12.5%
Menopausal Status	
Pre-Menopausal	31.3%
Peri-Menopausal	20.3%
Post-Menopausal	43.8%
Employment Status	
Full Time	40.6%
Part Time	17.2%
Disability	4.7%
Retired	14.1%
Not Employed	17.2%
Other	1.6%

Table 3. Description of Disease and Treatment Variables.

Variable	N = 51
Stage	
0	4%
I	41%
II	39%
III	14%
Positive Nodes	
0	50%
More than 1	50%
Surgery	
Lumpectomy	52.7%
Mastectomy	40%
Bilateral Mastectomy	7.3%
Chemotherapy	
No	26.6%
Yes	59.4%
Radiation	
No	23.4%
Yes	64.1%
Estrogen Blocking Therapy	
No	26.6%
Yes	59.4%
Time elapsed since diagnosis to baseline (months)	12.04
Time elapsed since end of treatment to baseline (months)	5.11

Table 4. Change in dependent variables calculated as follow-up minus baseline for intervention group only.

Dependent Variables	Baseline Score		Follow-up Score		Change Score (Follow-up – Baseline)		
	Mean	SD	Mean	SD	Mean	SD	N
PTGI							
Total	89.63	19.00	94.98	17.89	3.33	11.78	39
Factor I Relating to Others	28.80	6.54	30.26	6.50	1.00	5.13	39
Factor II New Possibilities	22.40	5.39	23.61	4.60	.49	3.20	39
Factor III Personal Strength	16.64	3.84	18.31	3.42	1.18	2.75	39
Factor IV Spiritual Change	9.03	2.45	9.32	2.33	-.058	1.49	39
Factor V Appreciation of Life	12.75	3.09	13.47	3.15	.73	2.46	39
CESD	12.22	10.50	10.11	8.04	-1.87	6.79	42
NK							
NKCC Activity (%)	14.78	7.24	17.61	10.45	2.083	10.17	28
NK Number (cells/mm^3)	120.98	68.00	139.76	75.77	17.94	71.50	28
Total Percent of NK cells (%)	5.67	2.80	6.06	2.41	.216	2.484	28
Urinary Cortisol (Corrected by creatinine, µg/dl)	.052	.038	.048	.039	-.008	.045	32

Table 5. Change in independent variables calculated as follow-up minus baseline.

Independent Variables	Mean	SD	N
External Comfort			
Session 2	21.02	2.97	47
Session 9	23.55	1.01	47
Change	2.29	2.67	38
Salivary Cortisol Session 9			
Pre-relaxation	0.119	0.08	37
End of session	0.086	0.09	40
Change	-.031	.069	37

** Change is calculated as follow-up minus baseline.*

Table 6. Correlations between dependent and independent variables.

	External Comfort Session 9			Change in External Comfort (Session 9 – Session 2)			Change in Salivary Cortisol (End of session – Pre-relaxation)		
	r	p	N	r	p	N	r	p	N
Change in Total PTGI	.173	.147	39	-.450*	.006	31	.125	.259	29
Change in PTGI Factor 1 Relating to Others	.185	.129	39	-.414*	.010	31	.249	.096	29
Change in PTGI Factor 2 New Possibilities	.163	.161	39	-.323*	.038	31	-.081	.339	29
Change in PTGI Factor 3 Personal Strength	.215	.095	39	-.266	.074	31	.026	.448	29
Change in PTGI Factor 4 Spiritual Change	.139	.200	39	-.222	.115	31	.229	.116	29
Change in PTGI Factor 5 Appreciation of Life	-.082	.310	39	-.594*	<.0001	31	-.039	.420	29
Change in CESD score	-.107	.258	39	-.198	.183	23	.016	.473	21
Change in Total Percent of NK Cells (%)	.387*	.028	25	-.427*	.050	16	.058	.429	12
Change in NK Number (cells/mm^3)	.330	.054	25	-.361	.085	16	.180	.288	12
Change in NKCC Activity (%)	.284	.084	25	-.190	.240	16	.485	.055	12
Change in Urinary Cortisol (µg/dl)	.236	.110	29	.250	.159	18	-.159	.258	19

* Change in outcome variables was calculated as follow-up score – baseline score.

Table 7. Summary of Simple Regressions Analyses for External Comfort Session 9 Predicting Outcome Variables.

External Comfort Session 9	B	Intercept	ß	R2	d.f.	P
Change in Total PTGI	2.525	-58.27	.173	.030	(1,37)	.293
Change in PTGI Factor 1 Relating to Others	1.162	-27.436	.185	.034	(1,37)	.259
Change in PTGI Factor 2 New Possibilities	.662	-15.320	.163	.027	(1,37)	.322
Change in PTGI Factor 3 Personal Strength	.725	-16.287	.215	.046	(1,37)	.190
Change in PTGI Factor 4 Spiritual Change	.225	-5.633	.139	.019	(1,37)	.400
Change in PTGI Factor 5 Appreciation of Life	-.250	6.404	-.082	.007	(1,37)	.620
Change in CESD score	-1.023	21.78	-.107	.010	(1,37)	.516
Change in Total Percent NK Cells (%)	0.953	-22.726	.387	.150	(1,23)	.056
Change in NK number (cells/mm $^{3)}$	18.327	-432.53	.330	.109	(1,23)	.108
Change in NKCC Activity (%)	3.136	-70.502	.284	.081	(1,23)	.169
Change in Urinary Cortisol (µg/dl)	-.396	-.002	.236	.055	(1,27)	.219

* Change in outcome variables was calculated as follow-up score – baseline score.

Table 8. Summary of Simple Regressions Analyses for Change in External Comfort Predicting Outcome Variables.

Change in External Comfort (Session 9 – Session 2)	B	Intercept	ß	R2	df	p
Change in Total PTGI	-2.149*	2.901	-.450	.203	(1,29)	.011
Change in PTGI Factor 1 Relating to Others	-.795*	.606	-.414	.171	(1,29)	.021
Change in PTGI Factor 2 New Possibilities	-.434	.439	-.323	.104	(1,29)	.077
Change in PTGI Factor 3Personal Strength	-.275	1.021	-.266	.071	(1,29)	.148
Change in PTGI Factor 4 Spiritual Change	-.110	-.108	-.222	.049	(1,29)	.230
Change in PTGI Factor 5 Appreciation of Life	-.535	.942	-.594	.353	(1,29)	<.001
Change in CESD score	-.386	1.518	-.198	.039	(1,21)	.366
Change in Total Percent NK Cells (%)	-.330	.005	-.427	.182	(1,14)	.099
Change in NK number (cells/mm $^{3)}$	-8.77	12.37	-.361	.130	(1,14)	.170
Change in NKCC Activity (%)	-.765	3.195	-.190	.036	(1,14)	.480
Change in Urinary Cortisol (µg/dl)	-.003	-.015	.250	.062	(1,16)	.317

* Change in outcome variables was calculated as follow-up score – baseline score.

Table 9. Summary of Simple Regressions Analyses for Change in Salivary Cortisol Predicting Outcome Variables.

Change in Salivary Cortisol (End of session – Pre-relaxation)	B	Intercept	ß	R2	d.f.	p
Change in Total PTGI	67.198	2.667	.125	.016	(1,27)	.517
Change in PTGI Factor 1 Relating to Others	65.413	.977	.249	.062	(1,27)	.193
Change in PTGI Factor 2 New Possibilities	11.181	.155	-.081	.006	(1,27)	.678
Change in PTGI Factor 3 Personal Strength	4.178	1.265	.026	.001	(1,27)	.815
Change in PTGI Factor 4 Spiritual Change	14.521	-.0005	.229	.052	(1,27)	.232
Change in PTGI Factor 5 Appreciation of Life	-5.013	.275	-.039	.002	(1,27)	.841
Change in CESD score	6.506	2.959	.016	<.001	(1,19)	.946
Change in Total Percent NK Cells (%)	6.506	.329	.058	.003	(1,10)	.858
Change in NK number (cells/$mm^{3)}$	365.99	1.941	.180	.032	(1,10)	.575
Change in NKCC Activity (%)	315.026	6.608	.485	.235	(1,10)	.110
Change in Urinary Cortisol (µg/dl)	-.311	-.027	-.159	.025	(1,17)	.516

* Change in outcome variables was calculated as follow-up score – baseline score.

Table 10. Means and Standard Deviations for PTGI factors by High/Low Change in External Comfort and by Timepoint.

PTGI	Group 1 Little or No Change In External Comfort				Group 2 Greater Change In External Comfort			
	Baseline		Follow-up		Baseline		Follow-up	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Total	89.45	19.60	89.20	21.91	90.53	21.87	101.33	12.21
Factor I	27.80	7.42	27.55	7.40	30.82	5.92	33.20	4.39
Factor II	22.35	5.39	22.55	5.89	22.00	6.40	24.8	3.05
Factor III	17.00	3.80	17.20	4.15	16.41	4.73	19.40	2.82
Factor IV	8.95	2.24	8.45	2.42	9.41	2.69	10.33	1.99
Factor V	13.35	3.23	13.45	3.62	11.88	3.59	13.60	2.35

FIGURES

Figure 1. Frequency Distribution for External Comfort at Session 2.

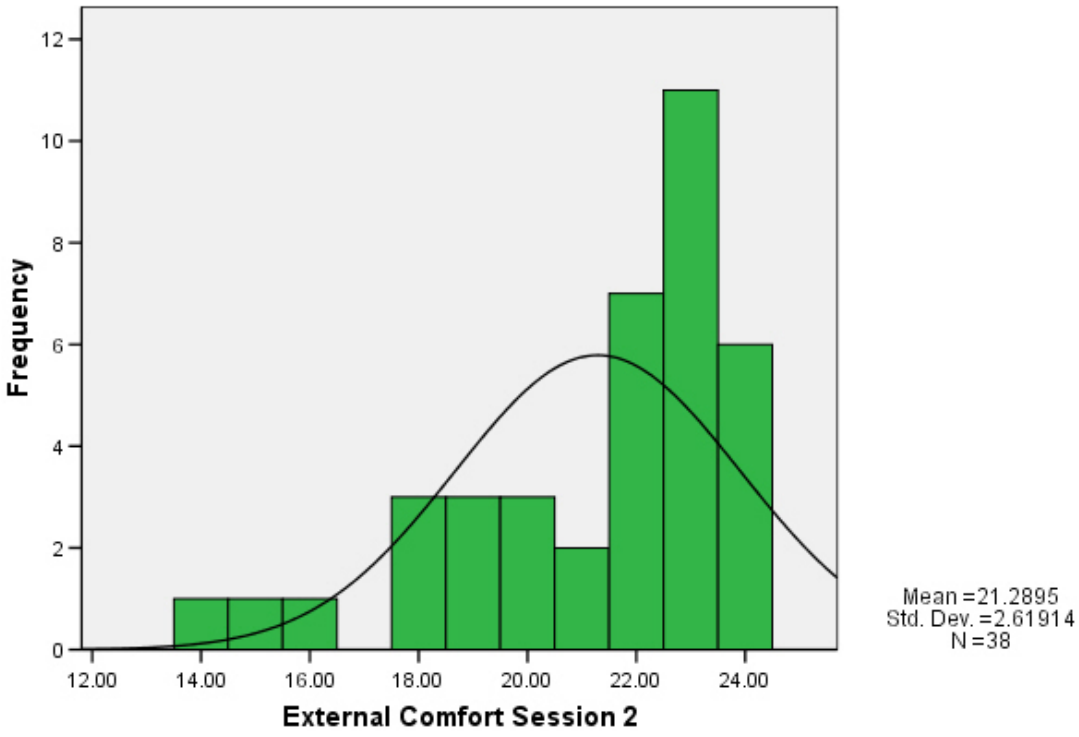


Figure 2. Frequency Distribution for External Comfort at Session 9.

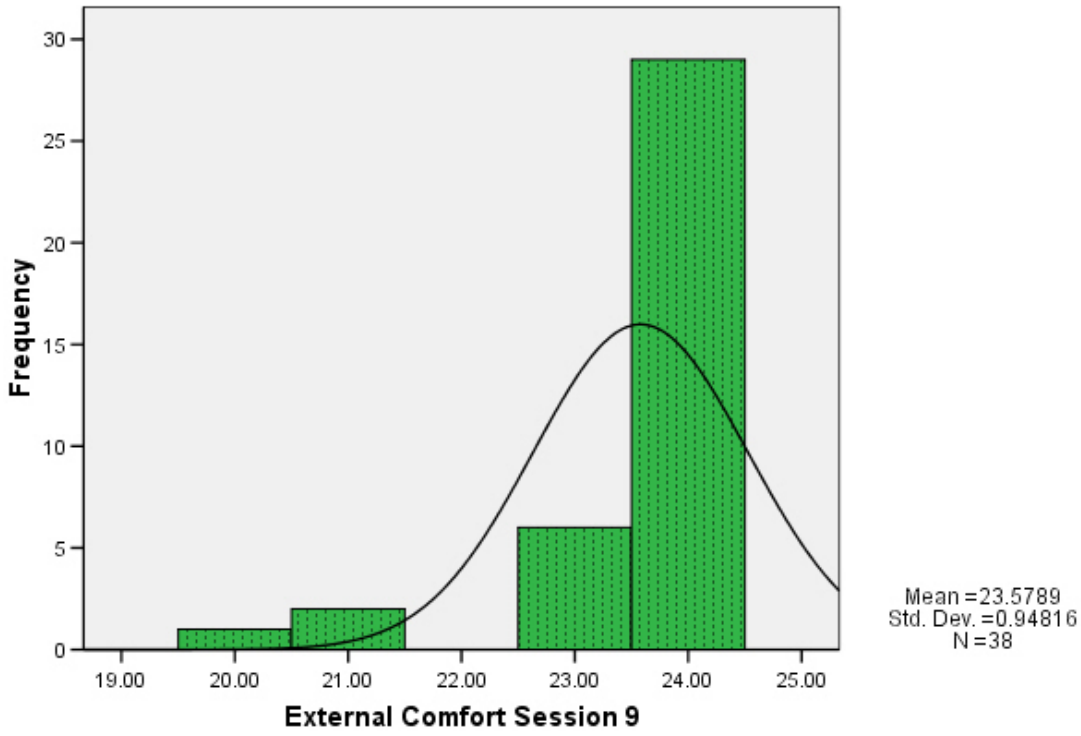
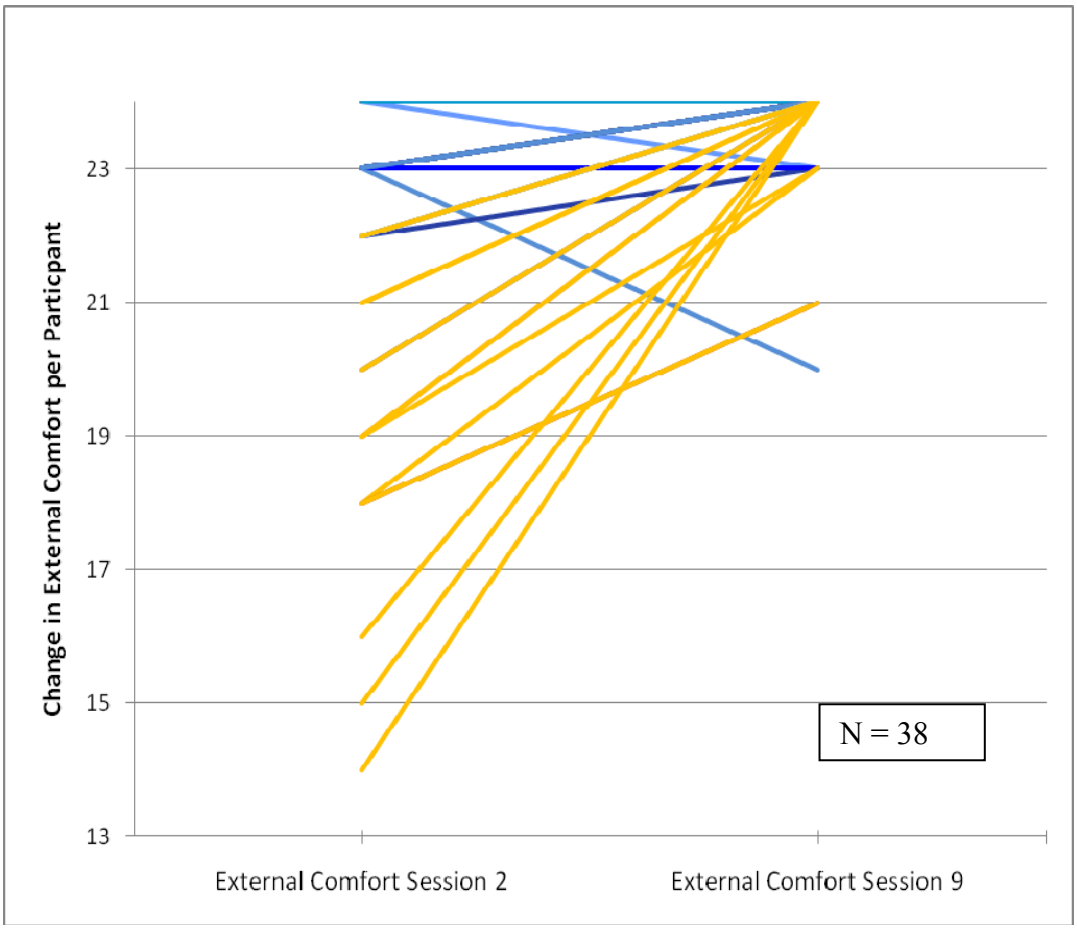


Figure 3. Change in External Comfort from session 2 to session 9.



A median split of the data by External Comfort yielded two groups of participants:

Indicate participants with negative, little or no change in EC. In general, these participants started the intervention with high EC scores and retained high scores throughout. Participants in this group are, in general, consistently high on EC.

Indicate participants who experienced greater change in EC. In general, these participants scored lower on EC at the beginning of the intervention, and increased their scores towards the end.

Figure 4. Change in means of External Comfort from session 2 to session 9.

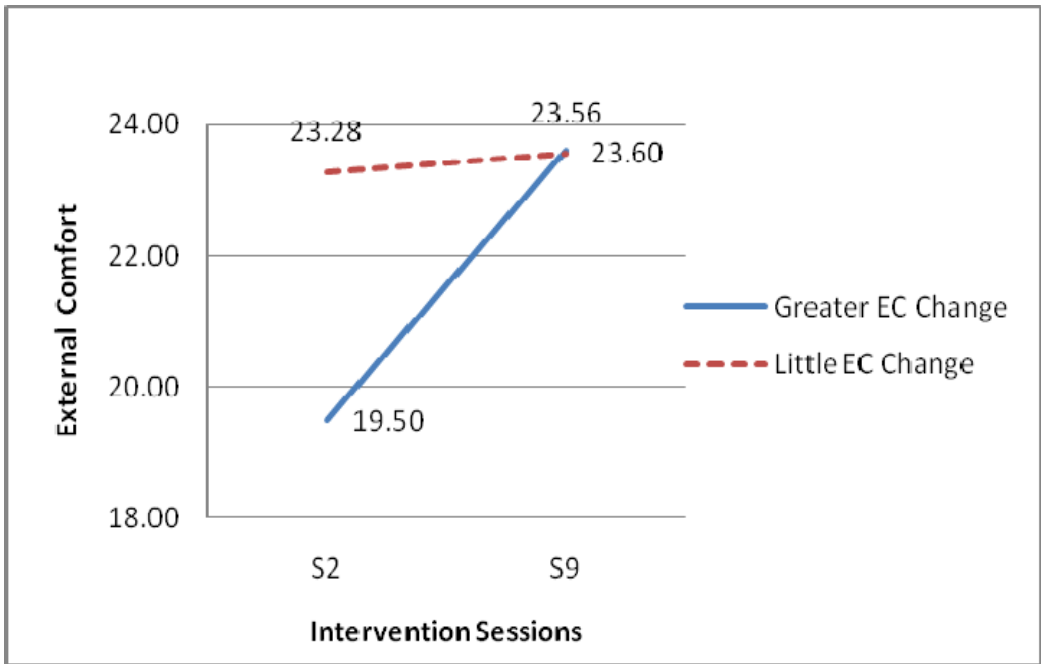


Figure 5. Change in means of Total PTGI from baseline to two weeks after the intervention.

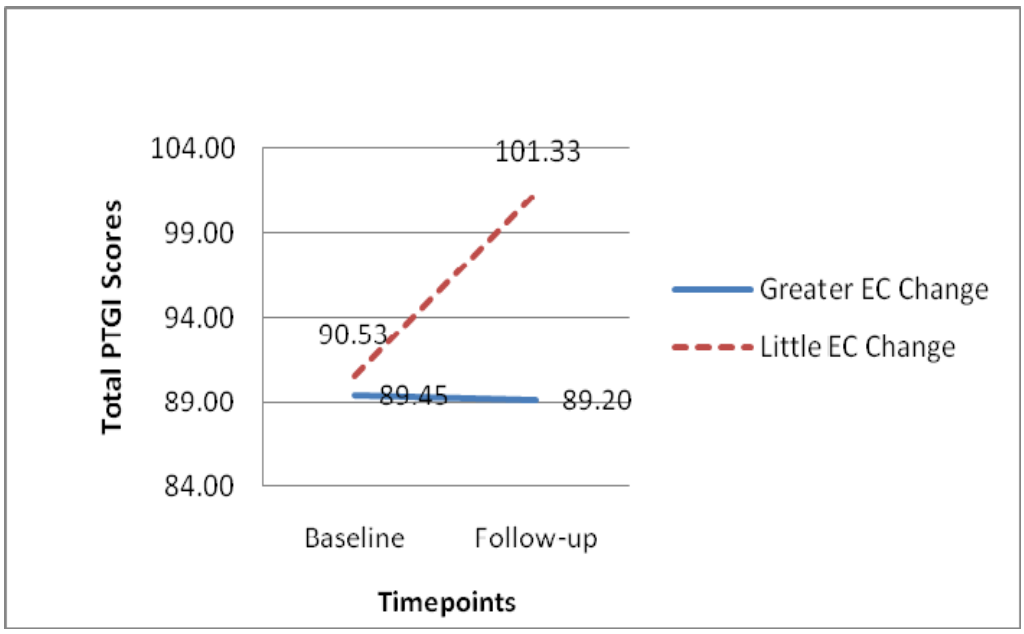


Figure 6. Change in means of PTGI Factor I Relating to Others from baseline to two weeks after the intervention.

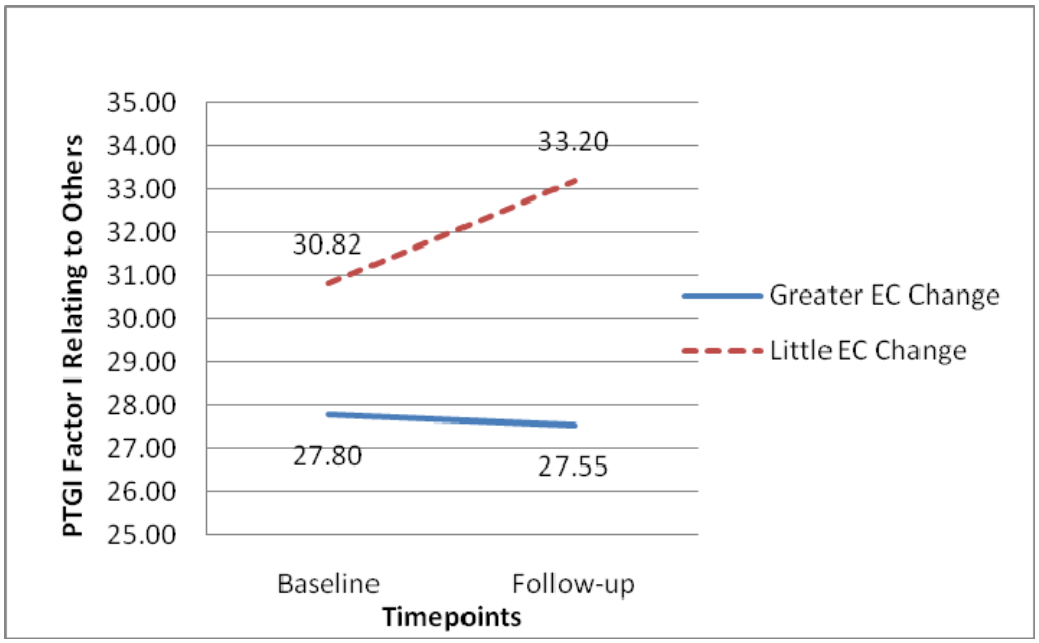


Figure 7. Change in means of PTGI Factor II New Possibilities from baseline to two weeks after the intervention.

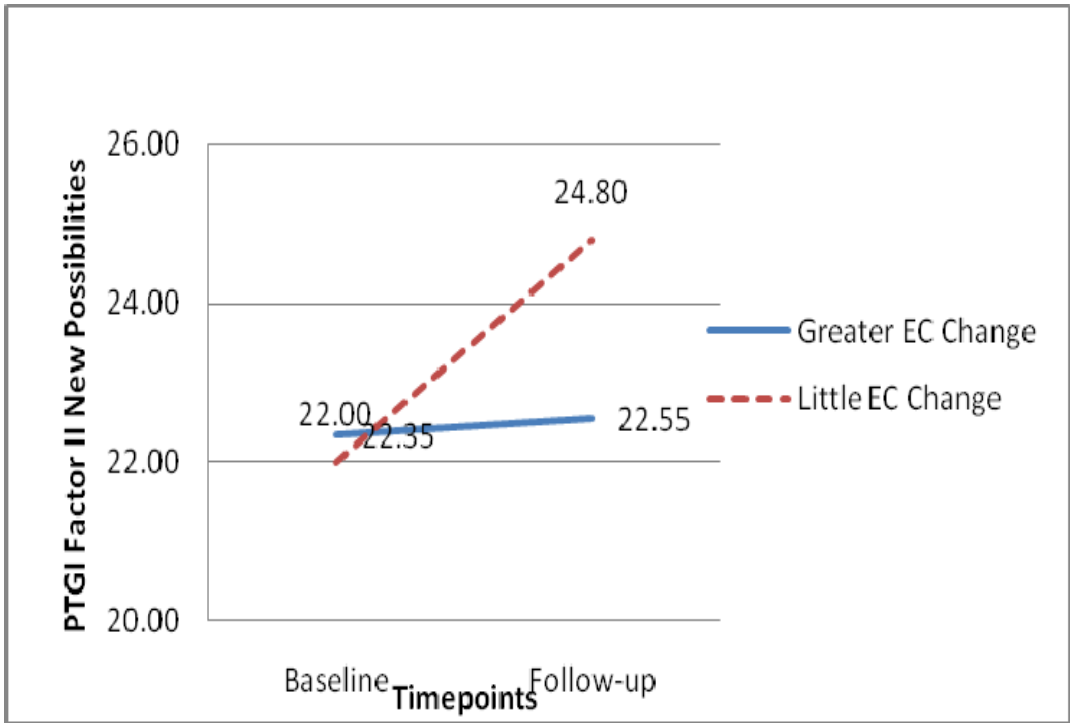
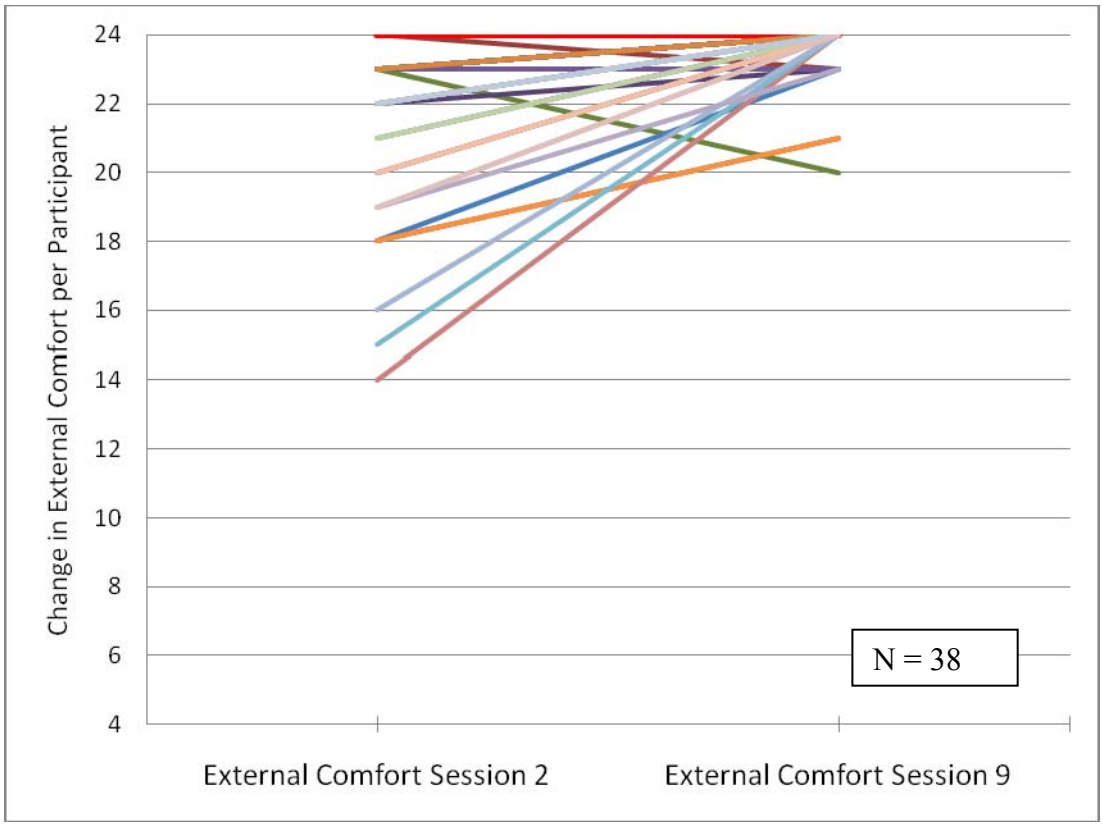


Figure 8. Ceiling Effect on Change in External Comfort.



Note: The graph illustrates the range of External Comfort (4 to 24) and the distribution of participants' scores at both timepoints. A ceiling effect is evident as most participants reached the highest score in the range.

APPENDIX I. Comparison of Elements of Cohesion Used by Researchers.

	Attendance/ Dropout	Compatibility	Liking	How often the group should meet	Commitment	Attraction	Belongingness /Acceptance	Involvement and Concern among group members	Help	Replace a member	Safe	Comfortable	Understood	Close to others	Hope	Good	Clarity	Confident
Yalom & Rand, 1996	*		*	*						*								
Hand, Lamontagne and Marks, 1974			*						*								*	
Silbergeld, Koenig, Manderscheid, Meeker, & Hornung, 1975								*										
Lermer and Ermann, 1976											*	*	*	*	*	*	*	*
Teasdale, Walsh, Lancashire and Mathews, 1977			*					*										
Budman, Soldz, Demby, Feldstein, Springer, & Davis, 1989																		
MacKenzie & Tschuschke, 1993																		
Tschuschke & Dies, 1994											*	*	*	*	*	*	*	*
Marziali, Monroe-Blum, & McCleary, 1997								*									*	
Grabhorn, Kaufhold, and Overbeck, 2002											*	*	*	*	*	*	*	*
Woody and Adessky, 2002						*								*				
Taft, Murphy, King, Musser, & DeDeyn, 2003					*	*		*	*									
van Andel, Erdman, Karsdorp, Appels and Trijsburg, 2003		*	*	*	*		*	*						*				
Morillo, 2004											*	*	*	*	*	*	*	*
Marmarosh, Holz, & Schottenbauer, 2005						*	*											

	Attendance/ Dropout	Compatibility	Liking	How often the group should meet	Commitment	Attraction	Belongingness /Acceptance	Involvement and Concern among group members	Help	Replace a member	Safe	Comfortable	Understood	Close to others	Hope	Good	Clarity	Confident
McNeil, 2006																		
Joyce, Piper, & Ogrodniczuk, 2007		*			*													
Lorentzen 2008		*			*													
Total number of times used	1	3	4	1	4	3	2	5	2	1	4	4	4	6	4	4	6	4

Note: The above table only includes in studies that have studied relationships between cohesion and outcomes.

APPENDIX II

Relatedness measure: The Stüttgarter Bogen (SB)

The Way You Felt in Group Today

Directions: In each row below is a word (and its opposite) that people may use to describe themselves. Please mark (_) ONE answer in each row that best describes *how you felt in today's group*. There are no right or wrong answers.

	A great deal		Moderately	A little bit	A little bit	Moderately		A great deal	
IN TODAY'S GROUP I FELT I WAS…									
1. HOPELESS	-3	-2	-1	1	2	3	HOPEFUL
2. SAFE	3	2	1	-1	-2	-3	VULNERABLE
3. COMFORTABLE	3	2	1	-1	-2	-3	UNCOMFORTABLE
4. LIKE A STRANGER	-3	-2	-1	1	2	3	CLOSE TO OTHERS
5. FEELING VERY GOOD	3	2	1	-1	-2	-3	MISERABLE
6. CONFUSED	-3	-2	-1	1	2	3	SEEING THINGS CLEARLY
7. MISUNDERSTOOD	-3	-2	-1	1	2	3	UNDERSTOOD
8. UNCERTAIN ABOUT MYSELF	-3	-2	-1	1	2	3	SELF-CONFIDENT

Legend

Internal Comfort

External Comfort

APPENDIX III

CES-D

Next is a list of the ways you may have felt or behaved over the past week. Please indicate how often you have felt this way during the past week. Use these response choices:

1 = Rarely or none of the time (less than 1 day)
2 = Some or a little of the time (1-2 days)
3 = Occasionally or moderate amount of time (3-4 days)
4 = Most or all of the time (5-7 days)

During the past week . . .

_____ 1. I was bothered by things that usually don't bother me.
_____ 2. I did not feel like eating; my appetite was poor.
_____ 3. I felt that I could not shake off sad feelings even with help from my family or friends.
_____ 4. I felt that I was just as good as other people.
_____ 5. I had trouble keeping my mind on what I was doing.
_____ 6. I felt depressed.
_____ 7. I felt that everything I did was an effort.
_____ 8. I felt hopeful about the future.
_____ 9. I thought my life had been a failure.
_____ 10. I felt fearful.
_____ 11. My sleep was restless.
_____ 12. I was happy.
_____ 13. I talked less than usual.
_____ 14. I felt lonely.
_____ 15. People were unfriendly.
_____ 16. I enjoyed life.
_____ 17. I had crying spells.
_____ 18. I felt sad.
_____ 19. I felt that people disliked me.
_____ 20. I could not get "going."

APPENDIX IV

PTGI

People sometimes find that the crisis of a bad event eventually leads to positive changes in their lives. For each of the items below, indicate the degree to which the change described in the item has occurred in your life—as of today—as a result of your crisis. Use the following response options:

I have experienced a positive change in this respect:

1= to no degree (I have not experienced a positive change).
2= to a very small degree.
3= to a small degree
4= to a moderate degree.
5= to a great degree.
6= to a very great degree.

_____ 1. My priorities about what is important in life.
_____ 2. I'm more likely to try to change things which need changing.
_____ 3. An appreciation for the value of my own life.
_____ 4. A feeling of self-reliance.
_____ 5. A better understanding of spiritual matters.
_____ 6. Knowing that I can count on people in times of trouble.
_____ 7. A sense of closeness with others.
_____ 8. Knowing I can handle difficulties.
_____ 9. A willingness to express my emotions.
_____ 10. Being able to accept the way things work out.
_____ 11. Appreciating each day.
_____ 12. Having compassion for others.
_____ 13. I'm able to do better things with my life.
_____ 14. New opportunities are available which wouldn't have been otherwise.
_____ 15. Putting effort into my relationships.
_____ 16. I have a stronger religious faith.
_____ 17. I discovered that I'm stronger than I thought I was.
_____ 18. I learned a great deal about how wonderful people are.
_____ 19. I developed new interests.
_____ 20. I accept needing others.
_____ 21. I established a new path for my life.

APPENDIX V

PTGI Factors and Ranges

PTGI FACTORS	ITEMS	POSSIBLE RANGE (0 to 5)
Factor I Relating to Others 7 items	6. Knowing that I can count on people in times of trouble. 7. A sense of closeness with others. 9. A willingness to express my emotions. 12. Having compassion for others. 15. Putting effort into my relationships. 18. I learned a great deal about how wonderful people are. 20. I accept needing others.	0 to 35
Factor II New Possibilities 5 items	2. I'm more likely to try to change things which need changing. 13. I'm able to do better things with my life. 14. New opportunities are available which wouldn't have been otherwise. 19. I developed new interests. 21. I established a new path for my life.	0 to 25
Factor III Personal Strength 4 items	4. A feeling of self-reliance. 8. Knowing I can handle difficulties. 10. Being able to accept the way things work out. 17. I discovered that I'm stronger than I thought I was.	0 to 20
Factor IV Spiritual Change 2 items	5. A better understanding of spiritual matters. 16. I have a stronger religious faith.	0 to 10
Factor V Appreciation of Life 3 items	1. My priorities about what is important in life. 3. An appreciation for the value of my own life. 11. Appreciating each day.	0 to 15