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Emotional Writing in an HIV+ Population: Assessing Two Scoring Methods of Emotional/ Cognitive Processing and Their Effects on Health Status, Physical Symptoms and Psychological Well-being.

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By

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Objective: The purpose of the present study is to examine whether level of written emotional expression (EE) and emotional/cognitive processing (ECP) for traumatic events predict health status (CD4 and VL), Category B symptoms, depression and anxiety in an HIV+ population over four years. Specifically, two different scoring methods of two variables within ECP (cognitive appraisal and self-esteem) will be compared to see if a change score (SMCHANGE) or a final score (SMFINAL) better predict outcomes. The possible mediating role of ECP in the relationship between EE and outcomes will also be explored. **Methods:** This longitudinal study assessed 169 HIV+ and diverse men and women in the midrange of illness as indicated by a CD4 number between 150 and 200 and no previous AIDS-defining symptom. EE/ECP data was gathered during baseline assessment and participants attended follow-up assessments every 6 months for a period of 4 years. Hierarchical Linear Modeling was used to examine change over time in CD4, VL log, Category B symptoms, depression and anxiety controlling for age, gender, ethnicity, education, anti-HIV medication and baseline values for each outcome. In addition, analyses for CD4 and VL log were rerun controlling for medication adherence. **Results:** Positive EE was found to be

significantly related to only CD4 and Category B symptoms slopes. Negative EE was not related to any outcome. ECP was found to be related to CD4, VL log and Category B symptoms slope. No relationships were found between EE/ECP and depression and anxiety. SMFINAL scores on ECP subscales were found to predict CD4 and VL log slope better than SMCHANGE, but SMCHANGE scores predicted Category B symptoms slope better than SMFINAL. Within meditational analyses, ECP was found to mediate the relationship between positive EE and CD4 slope controlling for adherence. Positive EE mediated the relationship between ECP and Category B symptoms slope. **Conclusions:** Higher engagement in positive EE and ECP within emotional writing about a trauma contributes to beneficial changes in health outcomes over time within HIV+ individuals. SMFINAL seems to be more related to CD4 and VL log slope while SMCHANGE seems to be more related to Category B symptoms slope, indicating that both scoring methods within ECP seem to be valuable. Findings support the meditational role of ECP between EE and CD4, and provide new evidence that positive EE plays a meditational role between ECP and Category B symptoms. These findings can be used to help improve health for patients in future studies or in CBT therapies.

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LIST OF ABBREVIATIONS

ACTG	AIDS Clinical Trials Group Adherence Measure
AIDS	Acquired Immunodeficiency Syndrome
BDI	Beck Depression Inventory
CA	Cognitive Appraisal subscale of ECP (has final and change score)
CD4	Cluster of Differentiation 4 or Helper T Cells
EBV	Epstein-Barr Virus
ECP	Emotional/Cognitive Processing
EE	Emotional expression
EI	Experiential Involvement subscale of ECP (only one scoring)
EW	Expressive Writing
HAART	Highly Active Antiretroviral Therapy
HIV	Human Immunodeficiency Virus
HLM	Hierarchical Linear Modeling
PS	Problem-Solving subscale of ECP (only one scoring)
PTSD	Post-Traumatic Stress Disorder
SE	Self-Esteem subscale of ECP (has final and change score)
SMCHANGE	Scoring Method for Change Score on ECP subscales
SMFINAL	Scoring Method for Final Score on ECP subscales
STAI-STATE	State-Trait Anxiety Inventory – State portion
VL	Viral Load

Chapter 1. Introduction

Human immunodeficiency virus (HIV) has become an important global health concern due to high rates of infection and death in recent years. Over 33 million people are living with HIV worldwide, and an estimated 2.7 million new infections as well as 2.0 million acquired immunodeficiency syndrome (AIDs)-related deaths were reported in 2008 (UNAIDS AIDS Epidemic Update, 2009). In North America alone during the same year, there were 55,000 new infections and 25,000 deaths (UNAIDS AIDS Epidemic Update, 2009). Due to the magnitude of this epidemic, health concerns surrounding HIV are increasing.

The disease caused by HIV is incurable and chronic, deteriorating the host's immune system and causing an increasingly high susceptibility to infections with opportunistic diseases. As professionals around the world search for a cure, much research is being published and good antiretroviral medication is now available. Due to these advances, we have seen big changes in HIV disease progression. Despite the record-high infection frequency, the rate of infection is stabilizing and has the potential to decrease in the coming years due to great advances in the treatment of HIV (UNAIDS AIDS Epidemic Update, 2009). When the severity of this disease first became apparent in the 1980s, those infected were expected to develop AIDS and rapidly decline in health within 15 years (UNAIDS AIDS Fast Facts, 2008). Now, after advances in medicine and the introduction of regimens such as the highly active antiretroviral therapy (HAART), HIV+ individuals are not expected to rapidly decline or die prematurely, but are expected to live much longer and healthier lives with chronic HIV disease (The Antiretroviral Therapy Cohort Collaboration, 2008).

The increased HIV+ lifespan combined with the high rates of infection lead to a record high frequency of people living with HIV today (UNAIDS AIDS Epidemic Update, 2009). Within this population, there is variability in disease progression and lifespan that is even seen in HAART adherers, and attention has turned to possible underlying psychosocial factors as an explanation (Ironson et al., 2005; Pence, 2009). Living with a chronic disease in itself poses more potential stressors (e.g. disability, medication regimen, stigma, etc.) than living a completely healthy life. In addition, researchers have found that high rates of past trauma have occurred in the HIV+ population, with 50% reporting sexual or physical abuse and over 90% reporting at least one highly traumatic event in their lifetime, which leads to depression, anxiety, and PTSD (Whetten et al., 2008). In a review by Leserman (2008), trauma and stressful life events were found to be a risk factor for poor health outcomes and faster disease progression, whether the participants were active with the HAART medication regimen or not. In addition, Ironson et al. investigated the effects of psychosocial factors on immune health status in a longitudinal study using HIV+ participants (the current proposed study is an extension of this study). They found that initial depression, hopelessness and education predicted CD4 cell counts and HIV viral load over two years. Viral load change was predicted by avoidant coping as well as life event stress. Interestingly, participants who were high in cumulative depression and avoidant coping over all time points experienced almost twice the CD4 cell decline and greater VL increases than those low in depression and avoidant coping over all time points. These effects were seen above and beyond the effects of anti-HIV medication. Psychosocial stressors are undeniably playing a part in the lives and health of the HIV+ population.

In order to learn more about these relationships, it is important to investigate interventions targeted at the psychosocial aspect of HIV/AIDS in hopes of improving health outcomes. One proposed intervention method is to improve coping skills through expressive writing about stressful or traumatic events (Pennebaker & Beall, 1986). Expressive writing (EW) focuses on the expression and processing of thoughts and emotions, and has developed into a widely used intervention.

History of Expressive Writing

In the 1980s, after several studies on emotional inhibition, Pennebaker (1985) concluded that not disclosing thoughts and feelings surrounding a negative experience or trauma may be related to poor health consequences. He believed that long-term emotional inhibition causes rumination, which causes heightened physiological activity, and over time, stress-related disease. However, many people do not choose to disclose emotions related to a severe and personal event because it is a difficult action to take without guidance and an outlet through which to do so. Taking this into account, Pennebaker and Beall (1986) developed the EW paradigm to give people a therapeutic tool with which to express emotions and thoughts that may otherwise be inhibited. They posited that this release of emotions through writing could reduce long-term stress and consequently, disease risk.

In their first study, Pennebaker and Beall (1986) tested their proposed EW paradigm and found that participants who wrote about the emotions surrounding a traumatic experience exhibited increased short-term physiological arousal but decreased long-term health problems. Participants in the control group who wrote about neutral daily events or those who wrote descriptively about trauma without disclosing emotions

showed an increase in long-term health problems. These results were strong enough to indicate that EW may be an important tool for the processing of traumatic events. With this initial study, Pennebaker and Beall establish a protocol and paved the way for more research to be conducted on the EW paradigm and its implications.

Traditional EW Protocol

The Pennebaker and Beall (1986) EW protocol has since been used in other EW studies. In their studies, they randomly assign participants to either a control group or one or more experimental groups. Participants in the control group are assigned to write about a neutral topic, such as what they had for breakfast or other day-to-day activities, while participants in the experimental group are asked to write about a past traumatic or stressful event while focusing on thoughts and emotions that surround that event. Writing is done in a controlled environment with no feedback or presence of the experimenter. Participants in each group typically write for fifteen to thirty minutes per day for three to five consecutive days. Although research has supported the effectiveness of the EW paradigm, the way in which it is effective is still somewhat unclear.

Mechanisms of Action

Researchers have proposed several theories to attempt to explain why the EW technique provides benefits to participants. One such theory, mentioned above and proposed by Pennebaker (1989), is the emotional inhibition theory. According to Pennebaker, the dis-inhibition of emotion is the mechanism by which emotional writing leads to long-term health benefits. This basic theory can be traced as far back as Freud, who created his "talking cure" because he believed that emotional inhibition led to psychological illness (Breuer & Freud, 1957).

Another proposed theory is cognitive adaptation theory. This theory posits that the change of existing schemas is required in order to process a traumatic event (Horowitz, 1986; Janoff-Bulman, 1992; Pennebaker, 1997; and Smyth, True, & Souto, 2001). Janoff-Bulman (1992) identified three core assumptions that she believes all individuals hold: (1) we are invulnerable, (2) the world is meaningful and comprehensible, and (3) we view ourselves in a positive light. Traumatic experiences are incongruent with these core beliefs and cause a disruption in the normal processing of information. In order to cope effectively, an individual must work to fit the event in with the beliefs or work to change the beliefs accordingly. Along a similar vein, Horowitz (1986) suggested a slightly different angle of the cognitive adaption theory, positing that a traumatic event challenges core beliefs, and an individual must work through the discrepancy in order to recover from the trauma. Lastly, Pennebaker (1997) and Smyth, True and Souto (2001) suggested that the process of writing about a trauma may aid in developing insight and cognitive assimilation of a traumatic event by allowing the individual to organize and provide structure to the memory. They further believed that these positive changes reduce stress associated with the event and improve long-term physical health.

Another theory that has been proposed is the exposure/emotional processing theory. This idea first originated with Mowrer's two factor theory (Mowrer, 1960). Using the classical conditioning model (Pavlov, 1927), Mowrer suggested that when an unconditioned aversive stimulus (UCS) elicits an unconditioned fear response (UCR), and a neutral stimuli gets paired with the UCS, an individual will become conditioned to the neutral stimuli (CS) and eventually a conditioned fear response (CR) will be elicited

by the CS alone. The CR may even carry over to additional stimuli. This conditioned fear response is negatively reinforced and maintained by behavioral actions, namely avoidance. By immediately escaping the CS after the CR, the individual is not able to test the CS to conclude that the UCS does not always follow it. Thus, the fear response is maintained. Exposure to aversive CS without the UCS has been used therapeutically to help correct unhealthy fear responses, such as those in post-traumatic stress disorder (Foa, Steketee, & Rothbaum, 1989). Through realizing that there is no danger associated with the CS, the extinction of UCS-CS associations is facilitated. In EW, it is believed that the act of writing about a traumatic event and emotions over several occasions is a form of exposure, eventually facilitating extinction.

It has also been suggested that within the extinction piece of exposure, there may be an important emotional/cognitive processing (ECP) aspect. This theory began with Lang (1979), who proposed the bioinformational theory of emotion, suggesting that pathological fear is a cognitive structure based on false information about stimuli and their meanings. Foa and Kozak (1986) believed that exposure facilitates emotional processing and cognitive changes, which mediate the relationship between exposure (in the case of writing, emotional expression) and the reduction in fear response. The exposure provides corrective information about the feared stimuli, which changes cognitions and subsequently reduces fear. Within EW, researchers have followed this line of thought by suggesting that exposure to feared stimuli, faced through emotional writing, may lead to proper processing of emotional material, which will cause a reduction in avoidance of thoughts, emotions and physical sensations (Hayes et al., 1996; Marx and Sloan, 2002).

Sloan and Marx (2004) reviewed the evidence behind the theories proposed to explain the effectiveness of EW and found supporting and contradictory data for each theory. They suggested that this may be in part due to varying methodologies across studies. Although EW is found to be effective in many cases for processing traumatic events, why it works is still unclear. Sloan and Marx suggested that a combination of theories may be more effective at explaining EW outcomes, although this has not yet been tested. Frattaroli (2006) also examined the evidence behind each theory by conducting a meta-analysis. The theory that was found to be most supported by previous studies was the exposure theory, however, it was without the ECP aspect. No effect was found in studies using more ECP-directed instructions or that had a greater spacing in follow-up sessions to allow time for cognitive processing, although these requirements may not be necessary for the facilitation of ECP. As far as support for the exposure theory, Frattaroli found that in studies that used populations with a history of trauma, post-traumatic stress disorder scores were reduced after EW intervention. Also, studies that used more and longer writing sessions had more of an effect on health outcomes than those with fewer and shorter sessions. Despite the mixed findings on EW's mechanism of action, the technique deserves more attention and research.

The focus of this paper will be on EW within an HIV+ population asked to write about a trauma. Specifically, the focus will be on identifying the effects of emotional expression (EE) and ECP on health indicator outcomes, physical symptoms, and psychological well-being. Two different scoring approaches within ECP will be

examined, as well as ECP's possible mediating role between EE and health indicator outcome measures. Previous EW studies have shown support for this technique in many different populations.

Meta-analyses and Reviews of EW Studies

Several meta-analyses examining EW in different populations have been published. The findings are mixed, although there is a general trend towards positive health benefits. Smyth (1998) conducted a review of literature by examining the results of thirteen studies to determine health effects following an EW task. He found that EW had significant health benefits in the areas of reported physical health, psychological well-being, physiological functioning and general functioning. In another meta-analysis, Frisina (2004) analyzed effects of EW on health outcomes in participants with physical or psychiatric disorders. Nine studies were used and results indicated a mixed but overall positive effect. Results showed that EW improved health in those with minor and major medical conditions (i.e. asthma and cancer) and improved levels of depression and anxiety. Taking into account many more studies for meta-analytic review, Harris (2006) sought to determine if emotional writing affected healthcare utilization in comparison with neutral topic writing and no-writing control groups. Thirty randomized, controlled studies comprised of 2,294 participants were identified as either healthy using healthy participants, participants with pre-existing medical conditions, or participants with psychological issues. Results showed that healthcare utilization was reduced in healthy samples but not in samples with medical or psychological conditions. In addition, Frattaroli (2006) conducted a much larger meta-analysis, using evidence from 146 randomized EW studies. The results of this meta-analysis indicated that EW does have

beneficial psychological and physical health effects on participants. These benefits were shown mostly in studies that used paid participants with a history of trauma or health problems and required three or more writing sessions with follow-ups beginning in less than one month.

In contrast, there are a small number of review studies that have found little or no beneficial relationship between EW and health outcomes. Meads and Nouwen (2005) analyzed 61 studies and found no relationship between EW and physical health outcomes. In addition, Mogk, Otte, Reinhold-Hurley, and Kröner-Herwig (2006) conducted a review of 30 trials and found no significant effect of EW on subjects' health. These null findings are few in comparison to the many studies supporting the relationship between EW and improvements in health. In a more specific sense, it is also important to examine studies exploring the EW-health relationship in different sub-populations of the medically ill.

EW in Medically Ill Populations

Many studies have tested the effectiveness of EW in medically ill populations, examining it in diseases such as breast cancer, prostate cancer, fibromyalgia, lupus, rheumatoid arthritis and asthma. Overall, EW seems to benefit patients. Stanton et al. (2002) examined the effects of EW and benefit finding in patients with early-stage breast cancer. Patients were asked to write for four sessions and were randomly assigned to either an EW group where they wrote about their deepest thoughts and feelings regarding breast cancer, a positive writing group where they wrote about positive thoughts and feelings regarding their condition, or a control group where they wrote facts about their breast cancer experience. Cancer-related avoidance was also measured to explore the

degree to which participants actively attempted to avoid thoughts and feelings related to their condition. At the 3-month follow-up, results showed that EW was most beneficial for women with low avoidance and the positive writing task was most beneficial for women with high avoidance. Compared to the control group, EW participants reported fewer somatic symptoms and participants in both experimental groups reported fewer cancer-related medical visits.

In another study of early-stage breast cancer, Creswell et al. (2007) examined possible underlying psychological mechanisms of the positive health effects of EW. Self-affirmation, cognitive processing, and discovery of meaning were considered as potential mediators of the relationship. At a 3-month follow-up, content analysis of the essays showed that self-affirmation writing was related to fewer physical symptoms while cognitive processing and discovery of meaning were not related to any health improvements. Creswell et al. concluded that self-affirmation is an important mediator of the relationship between EW and health benefits.

In another study examining the effects of EW on women with metastatic breast cancer, patients were asked to complete four at home, twenty minute writing sessions over a three-week period (Low et al., 2010). A control group wrote about facts of their diagnosis while the experimental group wrote about emotions related to their cancer. Although no main effect of EW on health was found for the women, Low et al. found that women in the experimental group who were recently diagnosed reported significantly fewer somatic symptoms three months after the intervention than those who had lived

with the diagnosis for many years. Additionally, women who had low levels of social support seemed to benefit from the intervention in that they reported fewer intrusive thoughts three months post-intervention.

Rosenberg et al. (2002) examined the effects of EW on health outcomes in patients with prostate cancer. Participants were assigned to either an experimental group that was asked to write about prostate cancer and trauma or a control group that was asked to write about day-to-day activities. Results indicated that the experimental group reported fewer physical symptoms and less health care utilization than the control group at 3- and 6-month follow-ups.

EW has also been examined in chronic pain populations. In a sample suffering from fibromyalgia, participants were split into either a control group or the experimental group (Gillis et al., 2006). The control group was directed to write about neutral time management and the experimental group was asked to write about stressful experiences on four different days. No health benefits were found at the one month follow-up, but at the three month follow-up, results showed that EW was associated with better sleep, less health care utilization and marginally less physical disability than the control group.

Another study focusing on EW and fibromyalgia showed similar benefits (Broderick et al., 2005). Patients were randomized into a trauma writing group that wrote about a recent traumatic event, a control writing group that wrote about neutral daily activities, or another control group that did not write but received care as usual. The two writing groups wrote for twenty minutes on three days at one-week intervals. Broderick et al. found that the trauma writing group reported significant reductions in pain and

fatigue, and experienced significantly better psychological well-being than the control groups at a 4-month follow-up. However, these benefits were not maintained by the 10-month follow-up and therefore only short-term benefits were found.

Danoff-Burg et al. (2006) examined the effects of EW on pain in patients with lupus or rheumatoid arthritis. Patients were randomized into one of three groups (benefit finding, standard EW, or a control group) and were asked to write for four writing sessions. Results showed that patients in both experimental groups reported significantly reduced pain at a 3-month follow-up compared to those in the control group.

Lastly, Smyth, Stone, Hurewitz and Kaell (1999) found similar results in patients with asthma or rheumatoid arthritis. Patients wrote about the most stressful event of their lives or about emotionally neutral topics, depending on randomization assignment. At a 4-month follow-up, asthma patients in the experimental group showed improvements in lung function and rheumatoid arthritis patients in the experimental group showed improvements in overall disease activity, while control patients for both samples showed no improvements.

The literature suggests that EW is a powerful tool in the treatment of medical conditions. It has the potential to positively impact disease activity, decrease physical symptoms, improve sleep and reduce fatigue, decrease doctor visits, and improve psychological functioning. In addition to the previous medical conditions, EW has also been shown to have a positive impact on patient populations with HIV.

EW in HIV Populations

In a study by Petrie et al. (2004), thirty-seven HIV positive patients were randomly assigned to either an experimental intervention group that was asked to write about the most traumatic and emotional experiences of their lives, or a control group that wrote descriptively about day-to-day activities. Participants wrote essays on 4 consecutive days for 30 minutes per essay. HIV viral load and CD4 counts were taken at baseline and at two weeks, three- and six-months post-intervention. Viral load is a measure of the concentration of the virus in the bloodstream and a low count is indicative of better health. CD4 cells, or T-helper cells, are lymphocytes that activate and direct other immune cells in the presence of invading antigens, and a higher count is indicative of good immune system function. Follow-up results showed significantly increased CD4 cell counts in the experimental group compared to the control group. Although viral load dropped immediately after intervention for the experimental group, no significant difference was found between the experimental and control group at the end of follow-up assessments.

O'Cleirigh et al. (2003) conducted study that examined the role of EW in HIV+ long-term survival, using a single time point of EW essays. Specifically, they examined EE and four subscales of ECP (adaptive/realistic cognitive appraisal, self-esteem, approach-oriented problem solving and experiential involvement). Two groups were recruited for the study; one was a long-term survivor group (LTS; 46 patients who had survived at least 4 years past an AIDS-defining/Category C symptom, before starting protease inhibitors) and the other an HIV+ comparison group (89 patients in the midrange of the disease with no prior history of Category C symptoms; it should be noted that these

participants are also used in the sample for the current proposed study). Results showed that the LTS group was significantly higher on levels of EE and ECP than the comparison group. In addition, O'Cleirigh et al. found that ECP mediated the relationship between EE and long-term survival of HIV patients. In women only, ECP and EE were positively related to CD4 cell count, and ECP was negatively related to viral load. Only ECP was related to medication adherence and psychosocial variables such as perceived stress and social support. In a later article by some of the same authors, O'Cleirigh et al. (2008) further supported their previous findings regarding ECP's mediating role in the relationship between EW and health benefits. These researchers conducted a cross-sectional group comparison and found that a rare group of HIV+ individuals (identified as having a no Category-C symptoms despite a poor immune profile and no medication and no anti-HIV mediation) who wrote about trauma were found to engage in higher EE and ECP than the control group. In addition, ECP mediated the relationship of EE and group membership and was shown to lead to higher CD4 cell counts.

Rivkin et al. (2006) supported these ECP findings with by conducting a study to explore whether or not an EW intervention benefited HIV+ participants. A total of 79 HIV+ individuals were randomized to either an EW group (where they were asked to write about their deepest thoughts and feelings associated with living with HIV) or a control group (where they were asked to write about daily activities). No significant difference in the groups was found, although participants who used more causation, insight and social words in their writing showed improved immune function and reported

fewer negative changes at follow-up assessment. These findings suggest that emotional/cognitive processing (ECP) of material may be an important factor in the beneficial effects of the EW process.

EW and Psychological Well-Being

The benefits of EW on psychological well-being have also been explored, and previous research findings seem to trend towards a positive effect. For the focus of the present study, the effects of EW in depression and anxiety will be primarily reviewed.

Of the meta-analyses mentioned previously, three found EW to have a positive impact on psychological health (Frisina, 2004; Frattaroli, 2006; Smyth, 1998). In addition, Lepore (1997) conducted a study to investigate whether or not an EW intervention could help reduce intrusive thoughts, depression and stress about an upcoming exam. Seventy-four college-age participants were asked to write about their deepest thoughts and emotions related to the exam (experimental group) or about daily activities (control group). Results showed that participants in the EW group had fewer depressive symptoms than those in the control group as the exam date approached, but the level of thought intrusions did not change. It was suggested by Lepore (1997) that although thought intrusions did not decrease, EW seemed to help desensitize participants to them, which resulted in the lower depressive symptoms.

Gortner, Rude and Pennebaker (2006) also examined the effects of EW in a population of college students who were vulnerable to depression, as defined by having experienced past depressive symptoms. Participants were assigned to either an EW

group or a control group. Those students in the EW group showed significantly lower depressive symptoms at a 6-month follow-up assessment as compared to the control group. This effect appeared to be mediated by changes in rumination.

Koopman et al. (2005) used a population of 47 women who had survived intimate partner violence to examine the effects of EW on symptoms of depression, PTSD, and pain. Participants were randomly assigned to either an EW group or a neutral writing group. No differences were found for PTSD symptoms between the groups and interestingly, the neutral writing group exhibited a greater reduction in pain symptoms, but this is believed to be a chance finding. Although clinical depression was not a requirement for study entrance, results showed that depressive symptoms only decreased for those women who were depressed at baseline assessment.

Graf, Guadiano & Geller (2008) slightly altered the EW paradigm to be used in a homework design and examined its effects in an outpatient psychotherapy population. Participants were randomly assigned to either the EW condition or a control condition. At the end of the intervention, participants in the EW group showed significantly greater reductions in depressive and anxiety symptoms, although these effects may be partially mediated by the psychotherapy support that was provided before and after the intervention.

Another study examined a population of 50 students, randomized to either an EW group, writing about a trauma, or a control group, writing about daily activities (Hemenover, 2003). Results showed that participants in the EW group experienced higher levels of healthy functioning and a resilient self-concept at follow-up assessment,

as indicated by more personal growth, acceptance, positive regard of themselves, and decreased depression and anxiety. Those participants who used a higher number of insight words exhibited an increased level of autonomy.

Lastly, Smyth (1998) conducted a review of 13 EW studies and found that EW significantly benefited psychological well-being in participants, as defined by levels of positive and negative affect, happiness and sadness, anxiety, thought intrusions and adjustment. He suggested that these psychological benefits seem to be related to cognitive shifts in participants, such as discovering meaning of the trauma. It was shown that participants who used more insight words (e.g., understand, realize) seemed to exhibit more psychological well-being improvement than participants who used fewer.

In sum, although none of the above studies focused specifically on populations with clinical depression or anxiety, it seems that the EW protocol has the potential to provide general psychological benefits to participants. There is also evidence in the previously reviewed literature that EW provides health benefits for many medically ill populations, including breast cancer, prostate cancer, fibromyalgia, lupus, rheumatoid arthritis, asthma, and most importantly to this current study, HIV. It has been suggested that within EW, it may be important for participants to engage in ECP in addition to EE in order to experience health benefits. The EE and ECP subsets of EW are important and their individual association with outcomes requires more attention.

Emotional Expression & Emotional/Cognitive Processing

Emotional Expression

Emotional expression (EE) can be defined as the degree to which negative or positive emotion is expressed. In the case of this paper, participants engaged in EE through writing. EE is objectively measured by counting the number of positive and negative emotion words in an EW essay. By engaging in EE, participants may also be better able to engage in emotional/cognitive processing, which has been known to be a deeper level of processing.

Emotional/Cognitive Processing

Research has suggested that the resolution of a traumatic event may not be based solely on the act of emotional expression, but rather may lie in cognitive reappraisal of the event that is elicited by the emotional expression (Donnelly & Murray, 1991; Murray, Lamnin & Carver, 1989). In the context of EW, emotional/cognitive processing (ECP) captures this process and has been measured along with EE to predict health outcomes. ECP is the degree to which the participant processes or discusses meaning, deeper understanding, interpretations, and insight about a trauma or stressful event.

Esterling et al. (1994) found this process to be beneficial in a study examining 57 healthy, but Epstein-Barr virus (EBV) seropositive undergraduates. There were two experimental groups in this study: an EW group, who wrote about emotions related to a stressful event, and a oral disclosure group, who talked about emotions related to a stressful event. The control group was asked to write about trivial matters. Results showed that participants in the oral expression group had the best outcomes as far as

EBV antibody titers, and in fact, these participants exhibited the greatest gains in ECP measures. Participants in the EW condition used more positive and negative emotion words than participants in the oral expression condition and more negative words than participants in the control group. After intervention, EW participants showed better immune status than the control group. In another study of oral expression related to traumatic events in patients with EBV, Lutgendorf et al. (1994) found that participants with higher involvement in the disclosure process and those with less avoidance experienced significant immune benefits when compared to the control group.

Although ECP seems to promote health in participants who use oral emotional disclosure about traumatic events, it is important to examine the role of ECP within EW. Bower et al. (1998) conducted an EW study examining ECP and the discovery of meaning after a stressful event in 40 HIV-seropositive men. Results indicated that men who were active in ECP were more likely to find meaning in the event, and men who found meaning had higher CD4 cell counts and lower rates of AIDS-related death than those who did not. This suggests that ECP may facilitate the discovery of meaning, which may be related to positive health outcomes.

Additionally, within HIV and EW, ECP has been shown to be an important mediator in the relationship between EW and health benefits, as previously mentioned (O'Cleirigh et al., 2003; O'Cleirigh et al., 2008). In these studies, four specific subscales were used to measure ECP: 1) adaptive/realistic cognitive appraisal change, which measured the participant's improvements in their ability to make causal inferences and develop insight; 2) self-esteem improvements, which measured change in how good a participant felt about themselves after the event; 3) adaptive coping strategies or problem-

solving, which was used to measure the extent to which a participant actively pursued a plan to better his or her situation; and 4) experiential involvement, which was used to measure the extent to which the participant was involved in writing substantially and deeply about the topic. According to O'Cleirigh et al. (2003), these ECP variables were chosen as a way to measure the degree to which a participant was processing and resolving a stressful experience. The researches suggest that after processing parts of a stressor and reactions to it, a participant can develop insight and causal inferences can be made. With time, cognitive appraisals may become more positive, which may facilitate understanding of causal relationships, feelings of being in control, and even deeper processing of the event. As this happens, self-esteem may increase, which could lead to self-efficacy in the ability to make healthy changes. This current study uses these beliefs about ECP and part of the scoring methods used by O'Cleirigh et al. (2003 and 2008), which are elaborated on below.

Scoring of ECP

Although the role of ECP in EW seems to be important, there are some variations in ECP scoring and it is unclear as to which scoring method is better able to predict outcomes. Lutgendorf et al. (1994) used a different scale to rate ECP, and used it in an oral disclosure study. Bower et al. (1998) rated EW essays for ECP on two levels: cognitive processing (active, meaningful thinking about a stressful event) and discovery of meaning (shift in values or perspectives as a result of the event). ECP in both of these areas was rated low if a participant used one statement alluding to cognitive processing or discovery of meaning, and rated ECP as high if a participant used two or more of these statements.

In regards to the current study, we will be using a different method of ECP scoring that has been used in recent years, as mentioned above. This method identifies four main areas within ECP: cognitive appraisal, self-esteem, problem-solving, experiential involvement (O'Cleirigh, Ironson, et al. 2003). This researched set of ECP variables are subjectively rated on a seven-point Likert scale (i.e., 1 = none, 4=somewhat, 7= a lot). In the two previously mentioned studies by O'Cleirigh et al. (2003 & 2008), a change score was also calculated for two of the variables: cognitive appraisal and self-esteem. This scoring was developed to assess the degree to which a participant shifted in cognitive appraisal and self-esteem from immediately after the stressful event to the point at which they were writing the EW essay. Significant effects were found using this method of scoring and can be reviewed in the literature above (O'Cleirigh et al., 2003 & 2008). Esterling et al. (1994) also used this scoring method. However, it is unknown whether the change score for cognitive appraisal and self-esteem is the best prediction of outcome variables or if there may be a better way of scoring essays for ECP.

There are limitations to a change score in that it does not take into account that a person with a low initial score has more room to increase than a person with a high initial score. In addition, there are potential ceiling or floor effects inherent when calculating change scores. It may also be difficult for a rater determine a change score, due to the varying degree of disclosure about initial reactions to a trauma from participant to participant. It may be possible that a final score on the two ECP scales (e.g. cognitive appraisal and self-esteem) could also predict outcomes and could be a more reliable measure for doing so.

In this present study, I propose to compare 2 different scorings methods on two measures of ECP: change score versus final score of cognitive appraisal and self-esteem. Using these methods, it will be determined which strategy of scoring may be the best in predicting outcomes.

Summary and Conclusions

In sum, HIV is an incurable and chronic disease that is affecting millions of people worldwide (UNAIDS AIDS Epidemic Update, 2009). People who deal with a chronic illness face more stressors than those who lead healthy lives, and this population can especially benefit from psychosocial interventions to promote health. Pennebaker and Beall (1986) developed the EW paradigm as an intervention to improve overall health status through the emotional disclosure and processing of stressful events or traumas. Reviews and meta-analyses of EW studies show a positive trend towards improved physical and psychological health (Frattaroli, 2006; Frisina, 2004; Harris, 2006; and Smyth, 1998). Although not conclusive, some studies have shown that EW intervention can positively impact disease activity, decrease physical symptoms, improve sleep and reduce fatigue, decrease doctor visits, and improve psychological functioning in medically ill populations (breast cancer, prostate cancer, fibromyalgia, lupus, rheumatoid arthritis and asthma). More specifically, HIV disease progression can be affected by EW techniques, by increasing CD4 cell counts, decreasing HIV viral load, and possibly aiding in long-term survival (O'Cleirigh et al., 2003 & 2008; Petrie et al., 2004; Rivkin et al., 2006). Positive psychological health benefits, such as a decrease in depressive and anxiety symptoms, were found as well in populations consisting of

students, survivors of intimate partner violence, and psychotherapy outpatients (Gortner et al., 2006; Graf et al., 2008; Hemenover, 2003; Koopman et al., 2005; Lepore, 1997; and Smyth, 1998).

Within these relationships, it has been suggested that emotional/cognitive processing (ECP) plays an important role (Lutgendorf et al, 1994; Bower et al., 1998). This hypothesis is supported by the exposure/emotional processing theory of EW, which suggests that ECP may be a necessary step towards health benefits (Foa & Kozak, 1986). EE is used to capture objectively the number of positive or negative emotion words the subject uses in their writing, and ECP is the extent to which a subject interprets a trauma, makes conclusions about the event, arrives at beneficial insights, and overall displays deeper and more adaptive levels of thought. It may be that ECP mediates the relationship between EE and health benefits (O'Cleirigh et al., 2003; O'Cleirigh et al., 2008).

This proposed study has several objectives. Based on previous research, we assume that there are two important parts measured in EW: emotional expression and emotional/cognitive processing. However, scoring methods of ECP vary across studies. This paper will attempt to confirm the above relationships between EW and health outcomes, physical symptoms and psychological well-being in an HIV-seropositive sample, and will seek to determine which scoring method, a change in or final score on two variables of ECP, better predicts those outcomes. In addition, the meditational role of ECP in the relationship between EE and health outcomes will be explored.

Chapter 2. Objectives and Analyses

The purpose of the present longitudinal study was to examine whether written emotional expression (EE) and emotional/cognitive processing (ECP) of traumatic events predicts health status, physical symptoms, and psychological well-being (defined as lower levels of depression and anxiety) in an HIV+ population over time. Specifically, two different scoring methods of two variables within ECP were compared to determine if scoring method for change score (SMCHANGE), using a change score of cognitive appraisal and self-esteem (final minus initial), or scoring method for final score (SMFINAL), using a final score of cognitive appraisal and self-esteem, better predicted health status, physical symptoms, and psychological well-being in an HIV+ population over time. The possible mediating role of ECP between EE and outcomes was also explored. It was of interest to determine if the EE and ECP variables predicted outcomes over and above traditional control variables, medically important control variables and adherence to anti-HIV medication over time. Hierarchical linear modeling (HLM) was utilized for analyses, which allowed for the control of variables at each time point and made it possible to predict slope of outcomes. CD4 cell levels and VL were chosen as outcomes because of their ability to predict health (Powderly et al., 1998; Saag et al., 1996.

Objectives & Hypotheses

There are five main hypotheses that were tested: 1) EE & ECP (representing the two methods of scoring, SMCHANGE and SMFINAL) will predict health indicators, but ECP SMFINAL will predict the relationship better than SMCHANGE; 2) EE and ECP will predict physical symptoms, but ECP SMFINAL will predict the relationship better

than SMCHANGE; 3) EE and ECP will predict depression and anxiety, but ECP SMFINAL will predict the relationship better than SMCHANGE; 4) The relationship found for Objective 1 will be maintained when controlling for adherence; 5) ECP mediates the relationship between EE and psychological well-being.

Objective 1: To determine if EE & ECP predict health indicators (CD4 cell counts, and viral load), specifically:

a) To determine if EE predicts health indicators.
b) To determine if SMCHANGE for ECP predicts health indicators.
c) To determine if SMFINAL for ECP predicts health indicators.
d) To determine if one scoring method for ECP better predicts health indicators levels than the other.

Hypothesis 1: EE and both scorings of ECP will predict health indicators, but SMFINAL will predict the relationship better than SMCHANGE.

Objective 2: To determine if EE & ECP predict physical symptoms, specifically:

a) To determine if emotional expression predicts physical symptoms.
b) To determine if SMCHANGE for ECP predicts physical symptoms.
c) To determine if SMFINAL for ECP predicts physical symptoms.
d) To determine if one scoring method for ECP better predicts physical symptoms than the other.

Hypothesis 2: EE and both scorings of ECP will predict physical symptoms, but SMFINAL will predict the relationship better than SMCHANGE.

Objective 3: To determine if EE & ECP predict psychological well-being (measured by depression and anxiety levels), specifically:

a) To determine if EE predicts psychological well-being.
b) To determine if SMCHANGE for ECP predicts psychological well-being.
c) To determine if SMFINAL for ECP predicts psychological well-being.
d) To determine if one scoring method for ECP better predicts psychological well-being better than the other.

Hypothesis 3: EE & both scorings of ECP will predict psychological well-being, but SMFINAL will predict the relationship better than SMCHANGE.

Objective 4: To rerun the analyses for Objective 1 to determine if the relationships are maintained when controlling for traditional/medically important variables (e.g. age, gender, ethnicity, education, medication, months since baseline) as well as adherence to anti-HIV medication.

Hypothesis 4: The relationship found for Objective 1will be maintained when controlling for adherence.

Objective 5: To determine if ECP mediates the relationship between EE and psychological well-being.

Hypothesis 5: ECP mediates the relationship between EE and psychological well-being.

Analyses

The main analyses used HLM (Bryk & Raudenbush, 2002; Raudenbush et al., 2002) to explore the associations between EE and changes in psychological well-being, viral load, CD4 cell counts, and physical symptoms over four years. We also used HLM to explore the associations between SMCHANGE and SMFINAL for subscales of ECP and changes in the above outcome variables over four years. Within these analyses, it will be determined if SMFINAL predicts outcomes better than SMCHANGE. HLM was chosen because it allowed us to predict slope over time instead of a predicting a single time point. It also allowed us to control for important medical/health-related variables such as baseline CD4 cell count and medication that may vary for each participant at different time points. Outcome measures will be CD4 cell count, viral load, physical symptoms, depression and anxiety.

Variance in health outcomes, physical symptoms and psychological well-being are separated into two levels: Level 1 covariates include within-person changes, such as months since baseline, type of anti-HIV medication prescribed, and the interaction of these variables. Months since baseline represent the time that each of the 9 participant assessments were conducted in relation to baseline assessment and create the structure of the model slope and intercept. Anti-HIV medication options are as follows: no medication, combination therapy, or HAART. Age, gender (coded 1 = male, 0 = female), race (coded 1 = non-Hispanic, Caucasian, 0 = other), and education (coded 0 = less than high school, 1 = some high school, 2 = high school graduate, 3 = trade-school or some college, 4 = college graduate, 5 = graduate degree) are between-person characteristics that have been shown to be associated with changes in disease progression and are accounted for on Level 2. In this study, it is thought that employment and income could be influenced by disease progression, so education was used as an indicator of SES. Additionally, for each outcome measure, initial status is controlled for using baseline values (baseline CD4, baseline VL, baseline BDI, etc.). Similarly, VL was controlled for when VL was used as an outcome measure, and this was repeated within analyses for other outcome measures. Adherence to medication was also included as a covariate in level 2 for testing Hypothesis 4, due to its important role in the management of HIV disease progression (Carpenter et al., 2000; Kalichman et al., 1998; Ickovics et al., 1997). Adherence was not included in the first run of analyses but was included in the second. The predictors EE and ECP were included in level 2 in order to determine the main effects of emotional disclosure and emotional/cognitive processing on health

outcomes. Continuous variables were centered around their mean and categorical variables were dummy coded (zero represents the lowest level).

HLM Equations for Predicting Changes in Outcome Variables

Level 1:

$$Y_{ti} = \beta_{0i} + \beta_{1i}\,(\text{months since baseline})_{ti} + \beta_{2i}\,(\text{antretroviral1})_{ti} + \beta_{3i}(\text{antretroviral2})_{ti} + \beta_{4i}(\text{antretroviral1} \times \text{time})_{ti} + \beta_{5i}(\text{antretroviral2} \times \text{time})_{ti} + e_{ti}$$

Where:
Y_{ti} = CD4 count for participant i at time point t
β_{0i} = CD4 at baseline for the ith participant
β_{1i} = Slope representing change in CD4 for participant i
β_{2i}, β_{3i}, β_{4i}, β_{5i} = Slopes for the antiretrovirals (2 variables dummy coded) and the interaction of antiretrovirals and months since baseline, so that changes in CD4 due to medication at each time point can be controlled for.
e_{ti} = Error term for participant i at time t

In order to examine individual differences in level 1 change parameters, level 2 equations are needed.

Level 2:

$$\beta_{01}\,(\text{intercept}) = \gamma_{00+} + u_0$$

$$\beta_{1i}\,(\text{slope}) = \gamma_{10} + \gamma_{11}\,(\text{baseline CD4})_i + \gamma_{12}\,(\text{age})_i + \gamma_{13}\,(\text{gender})_i + \gamma_{14}\,(\text{ethnicity})_i + \gamma_{15}\,(\text{education})_i + \gamma_{16}\,(x^*)_i + u_1$$

$$\beta_{2i,\ 3i} = \gamma_{20},\ \gamma_{30}\ (\text{antiretroviral 1 or 2}),$$

$$\beta_{4i,\ 5i} = \gamma_{40},\ \gamma_{50}\ (\text{antiretroviral 1 or 2} \times \text{time})$$

Where:
γ_{00} = Group average of baseline CD4
γ_{10} = Average change in CD4 each month
γ_{20} and γ_{30} = Average effect on level of CD4 across patients from antiretroviral 1 or 2
γ_{40} and γ_{50} = Average effect on change in CD4 across patients from antiretroviral 1 or 2
γ_{11}–γ_{15} = Effect of the a priori covariates on change in CD4
γ_{16} = Effect of individual differences on CD4 slope (γ10) attributable to EE or ECP variables
u0, 1 = unexplained individual variance related to the estimation of the γ coefficients.

The HLM models that were used to predict VL, physical symptoms, depression and anxiety were the same as the equations above for CD4. The analyses for CD4 and VL were also rerun to control for adherence in level 2.

(x*) = EE, ECP using SMCHANGE, or ECP using SMFINAL were run in separate models and were used in place of this value to test the following hypotheses:

Hypothesis	x
1a, 2a, 3a, 4	EE
1b, 2b, 3b, 4	ECP using SMCHANGE
1c, 2c, 3c, 4	ECP using SMFINAL

In order to establish that ECP mediates the relationship between EE and outcomes, EE must first be significantly related to outcome variables independently. Mediation by ECP was significant if the relationship between EE and outcomes was weakened upon adding ECP into the model as a mediator.

Proposed HLM Equations for Testing Mediation

Mediation:

β_{1i} (slope) = $\gamma_{10} + \gamma_{11}$ (baseline CD4)$_i$ + γ_{12} (age)$_i$ + γ_{13} (gender)$_i$ + γ_{14} (ethnicity)$_i$ + γ_{15} (education)$_i$ + γ_{16} (EE)$_i$ + u_1

β_{1i} (slope) = $\gamma_{10} + \gamma_{11}$ (baseline CD4)$_i$ + γ_{12} (age)$_i$ + γ_{13} (gender)$_i$ + γ_{14} (ethnicity)$_i$ + γ_{15} (education)$_i$ + γ_{16} (EE)$_i$ + γ_{17} (ECP*)$_i$ + u_1

ECP* = Either SMchange or SMFINAL

Mediation was established when EE was no longer significant, but ECP remained significant.

Chapter 3. Method

Subjects

Participants were part of a larger longitudinal study (Ironson et al., 2005) and were enrolled on a paid volunteer basis. Participants were recruited and enrolled between 1997 and 2004 in South Florida and recruitment efforts focused on physician offices, specialty clinics, service organizations, and hospitals. The sample used for this study was also used as a control group in a previous study by O'Cleirigh and Ironson, et al. (2003), which examined EE and ECP in relation to HIV+ long-term survival.

Inclusion/exclusion criteria

Subjects were included in the current study if they were HIV positive in the midrange of disease at baseline assessment, as indicated by a CD4 cell range between 150 and 500. Extremely healthy HIV+ subjects (those with high CD4 counts) were excluded to avoid a ceiling effect, and subjects in advanced stages of HIV (those with low CD4 counts) were excluded to reduce the risk of intervention results being masked by the many effects of serious illness. Ironson et al. (2005) hypothesizes that subjects in the midrange of HIV disease have the potential to be most affected by the possible health benefits of EW. Other exclusion criteria for this study included: 1) history of a Category C or AIDS-defining symptom; 2) history of a CD4 count below 75; 3) current drug or alcohol abuse or dependence; 4) had active psychotic or suicidal symptoms; 5) did not read at an eighth grade level or above; 6) non-English speaking or writing; 7) were under age 18; and 8) suffering from active diseases or another potentially life threatening illness that could make study participation difficult.

For the purposes of the present study, participants were included in analyses if they had completed an essay at time point one and completed at least one follow-up assessment.

Design

This study was longitudinal in design and followed participants for four years. Baseline data, including the emotional writing essay, was collected from all participants between 1997 and 1999. Participants were then assessed approximately every 6 months for a period of 4 years (2000-2004). The complete study period lasted from 1997 to 2004.

Procedures

At baseline, subjects completed written informed consent, demographic profile questions (e.g. gender, ethnicity, age, education, income), blood draw for CD4 cell count and viral load (VL) assay, and psychosocial questionnaires, and a clinical assessment interview. Participants attended a follow-up assessment every 6 months, which included the questionnaires, a brief interview, and a blood draw. Blood from all participants was collected between 9:00 a.m. and 11:00 am to control for possible diurnal variation. This study and all procedures were approved by the institutional review board (Ironson et al., 2005).

Questionnaires & Measures

Researchers collected information from participants about demographics, medical history, and psychological status using self-report and interview measures. To measure adherence to participants' prescribed anti-HIV medication regimen, The AIDS Clinical

Trials Group (ACTG) Adherence Measure (Chesney et al., 2000) was given through interview. Adherence was calculated as the average percent of missed doses in the previous three days for the first five time point assessments. Participants were assessed for physical symptoms as defined by the experience of Category B symptoms of HIV within the 6 months prior to assessment. Examples of Category B symptoms include bacillary angiomatosis, thrush, vulvovaginal candidiasis, pelvic inflammatory disease, cervical dysplasia, hairy leukoplakia, diarrhea lasting more than one month, peripheral neuropathy, or two or more episodes of shingles.

Psychological Measures

Psychological information was also collected from participants. Beck Depression Inventory (BDI-I), a 21-item scale of cognitive, affective, and behavioral symptoms of depression over the past week, was used to assess participants for depression (Beck et al., 1961). Participants were also assessed for anxiety with the State portion of the State-Trait Anxiety Inventory (STAI-STATE), a 20-item scale of self-rated anxiety over the past week (Spielberger et al., 1970).

BDI-I and STAI scores were considered separately in the model as well as together, due to a high correlation between the two measures at each time point. It was thought that a combined BDI-I and STAI measure would represent a measure of psychological well-being. To construct this composite measure of psychological well-being, z-scores were calculated to standardize the scores, which were then averaged between BDI-I and STAI at each time point.

In addition, to determine eligibility, the Structured Clinical Interview Diagnostic-Diagnostic and Statistical Manual-III-R (American Psychiatric Association [*DSM-III-R*], 1980) was used in order to collect information pertaining to participant history of drug/alcohol abuse/dependence and psychotic symptoms.

Disease Progression Markers

> "CD4 lymphocyte count (CD3+CD4+) was determined by whole-blood 4-color direct immunofluorescence using a coulter XL-MCL flow cytometer. VL utilized the Roche Amplicor RT/PCR assay sensitive to 400 copies of plasma RNA," (Ironson et al., 2005, Page 3).

VL log was used in analyses to reflect a more reliable measure of VL.

Emotional writing measures

In addition to the questionnaires and measures completed at each time point, subjects were asked to write an essay in response to a prompt that stated, "Think of the most stressful or traumatic situation or feelings you have had to deal with since finding out you were HIV positive, including finding out you were HIV positive. We would like you to write a short essay (1–2 pages) regarding your feelings on this topic. Take about 20 min to do this.'' Essays were scored for emotional expression (EE; total number of positive emotion words, total number of negative emotional words, and total number of words altogether). Certain slang and expressions were counted if they were identified as referring to feelings or emotional states. Decisions regarding positive versus negative words were made with reference to a lexicon of emotion words from a previous study (O'Cleirigh, Ironson et al., 2003).

Emotional/cognitive processing measures

After essays were scored for EE, they were read again to identify evidence of the following four ECP areas: cognitive appraisal, self-esteem, adaptive coping strategies and experiential involvement. The cognitive appraisal scale measures the extent to which the participant understood the problem and discussed alternative explanations. The self-esteem scale measures the extent to which the participant indicated feeling better or less critical about the self. The problem-solving scale measures the extent to which a participant actively pursued a plan to better his or her situation. Lastly, the experiential involvement scale measures the extent to which the participant was involved in writing substantially about the topic. These variables were subjectively rated on a seven-point Likert scale (i.e., 1 = none, 4=somewhat, 7=very much).

However, two of these scales, cognitive appraisal and self-esteem, were given two ratings: a change score (SMCHANGE) and a final score (SMFINAL). This was done to determine if a change in or final level of these variables better predicts health outcomes, physical symptoms, and psychological well-being.

Composite scores were constructed with all four ECP subscales to reflect either SMCHANGE or SMFINAL, by averaging z-scores for subscales. All individual subscales of ECP as well as composite scores reflecting SMCHANGE and SMFINAL were run in separate equations in the HLM analyses to determine which scoring better predicted outcomes. The researchers compared the effect sizes, *t* values and *p* values for each scoring method to make this determination.

Training of Raters

Two raters, Lindsay Bira (author) and Vanessa Cutler were used in the ratings of the essays for this study. Both raters were graduate students, one in clinical psychology and one in English. The raters began 3-month training in the scoring of essays for EE and ECP prior to beginning rating on this sample. Raters were trained by Dr. Gail Ironson, the principal investigator in the study, and Rachel Ruffin, a former graduate student with extensive experience in scoring EW essays. The practice EW essays were pulled from a different sample and do not overlap with the essays that will be used for main analysis in this proposed study. After each rater individually scored a group of 10 essays, they attended a meeting with Dr. Ironson and Rachel Ruffin to discuss the ratings of each essay. Guidance was provided and this process was continued with 10 new essays until reliability was established. The final reliability ratings for this set of preliminary essays are displayed in Table 1 ($n = 14$, $r = > .737$, $p < .01$).

Inter-rater Reliability

The two raters mentioned above scored all EE and ECP variables in all essays ($N = 218$). In order to establish inter-rater reliability, 51 essays were randomly selected for use at two reliability checkpoints before the scoring process began. These checkpoints were performed at the beginning of scoring (Reliability Round 1; $n = 25$) and at the halfway point (Reliability Round 2; $n = 26$). For both rounds of checkpoints, inter-rater reliability was established on all measures ($r > .783$, $p < .01$). See Table 2 and 3 for specific reliability values.

Essay Topics

The essay topics were coded into 6 categories:

1. HIV diagnoses
2. HIV status disclosure
3. General HIV-related stress
4. Death of a loved one
5. Relationship issues
6. Other

The researcher decided on these categories by reviewing the most common topics in the participants' essays. The frequency and percentage of essays in each category can be viewed in Table 4.

Chapter 4. Results

Sample Characteristics

Our sample (n = 169) is a subset of a sample used in a previous study conducted by Ironson et al. (2005). Demographic as well as medical information can be found in the cited paper. Participants were of diverse gender, ethnicity and sexual orientation. Baseline assessment indicated that the mean CD4 cell count was 297 and average HIV viral load (VL) was 44,861 for participants. Seventy-seven percent of participants were taking antiretroviral medication at baseline and 90% reported taking medication at any time during the first 2 years of the study. Mean BDI-II scores at each time point can be found in Figure 1. Participants varied on level of emotional expression (EE) and emotional/cognitive processing (ECP), as shown by the descriptive information for these measures in Table 5. Descriptive information for participant scores on outcome measures and level of medication adherence can be found in Table 6 and 7. Correlations between the subscales of EE and ECP can be found in Table 8.

Testing of the Hypotheses

The basic equations for the HLM models as well as the explanation of equation terms can be found previously in the "Objectives and Analyses" section on pages 24-29. Within the first two outcome measures, CD4 and VL log, it is necessary to consider Objective 4 along with the other objectives when displaying and discussing the results. Objective 4 states that the analyses for CD4 and VL log will be rerun for Objective 1 to determine if the relationships are maintained when controlling for HIV medication adherence. It is hypothesized that the relationships will be maintained when controlling for adherence.

Objective 1: To determine if EE & ECP predict slope of health indicators (CD4 cell counts and viral load), specifically:

e) To determine if emotional expression (EE) predicts health indicators.

f) To determine if change score (SMCHANGE; on subscales CA and SE) for emotional/cognitive processing (ECP) predicts health indicators.

g) To determine if final score (SMFINAL; on subscales CA and SE) for ECP predicts health indicators.

h) To determine if one scoring method for ECP better predicts health indicators levels than the other.

Hypothesis 1: EE and both scorings of ECP will predict health indicators, but SMFINAL will predict the relationship better than SMCHANGE.

Objective 4: To rerun the analyses for Objective 1 to determine if the relationships are maintained when controlling for adherence, as well as traditional/medically important variables (e.g. age, gender, ethnicity, education, medication, months since baseline).

Hypothesis 4: The relationships found for Objective 1 will be maintained when controlling for adherence.

Prediction to CD4 Change Over Time

Basic Model

Table 9 exhibits the basic model results and significance tests for the change in CD4 levels over time, controlling for antiretroviral medications, time since baseline and baseline CD4. CD4 slope significantly decreased over time (γ_{10}) when controlling for the covariates. The HLM base model for CD4 shows that the average CD4 level for participants upon study entry is 271.52, which decreased at a rate of 7.09 CD4 cells per month, or 85 cells per year. This decrease was found to occur above and beyond the effects of medications, gender, SES, and ethnicity. There is also significant individual variation in the change in CD4 over time (χ^2 (163) = 560.04, $p < .001$).

Covariates

At level one, increase in CD4 is significantly related to being prescribed combination therapy or HAART medication (see Table 9). At level 2, higher education and higher CD4 at study entry was significantly related to less CD4 decline.

The Contribution of EE and Both Scoring methods of ECP (SMFINAL vs. SMCHANGE)

Significance tests for the predictive ability of level of emotional expression (EE) and emotional/cognitive processing (ECP) on the change in CD4 over time are displayed in Table 10. In terms of EE, higher number of total EE words (γ_{16}; trend) and positive EE words (γ_{16}) used in essays predicted CD4 increase over time, but no relationship was found for number of negative EE words. For ECP, trends indicated that CD4 increased with higher final scores (SMFINAL) for cognitive appraisal (CA; γ_{16}; trend) and self-esteem (SE; γ_{16}; trend), as well as change scores (SMCHANGE) of CA (γ_{16}; trend), although CA SMCHANGE did not have as much of a relationship with CD4 as did CA SMFINAL. CD4 also increased with higher levels of problem solving (PS; γ_{16}) and experiential involvement (EI; γ_{16}). When SMFINAL and SMCHANGE ECP composite scores were run in the model, it was again found that SMFINAL seems to predict change in CD4 better than SMCHANGE, although the two full ECP scoring methods were both significant predictors. The composite variable of only CA and SE SMFINAL was a significant predictor of change in CD4 but the SMCHANGE composite for these 2 variables was not.

Interpretation

These findings support the hypotheses that EE and both scorings of ECP predict CD4 change over time, and that SMFINAL predicts the relationship better than SMCHANGE.

Prediction to VL log Change Over Time

Basic Model

Table 11 displays the basic model results and significance tests for the change in viral load (VL) log levels over time, controlling for antiretroviral medications, time since baseline and baseline VL log. The model did not significantly predict change in VL log over time (γ_{10}) when controlling for the covariates. The HLM base model for VL log shows that the average VL log for participants upon study entry is 4.47 units, which increased at a rate of 0.012 U per month or 0.144 U per year. This increase was found to occur above and beyond the effects of medications, gender, SES, and ethnicity. Individual variation within change in VL (slope) was significant (χ^2 (163) = 288.28, $p <$ .001).

Covariates

At level one, there is a significant decrease in VL log that is due to being prescribed medication, both combination therapy and HAART (see Table 11). At level 2, higher education buffered VL increase.

The Contribution of EE and Both Scoring methods of ECP (SMFINAL vs. SMCHANGE)

Significance tests for the predictive ability of emotional expression (EE) and emotional/cognitive processing (ECP) on the change in VL log over time are displayed in

Table 12. In terms of EE, no relationship was found with number of negative EE words, positive EE words or total EE words used in essays. For ECP, VL decreased when participants had higher final scores (SMFINAL) and change scores (SMCHANGE) scores for cognitive appraisal (CA; γ_{16}) and self-esteem (SE; γ_{16}), with the SMFINAL relationship being stronger than SMCHANGE. VL also decreased with higher levels of problem solving (PS; γ_{16}) and no relationship was found for the experiential involvement subscale (EI; γ_{16}). When SMFINAL and SMCHANGE ECP composite scores were run in the model, all composite variables predicted change in slope and it was again found that SMFINAL seems to predict change in VL log better than SMCHANGE.

Interpretation

These findings support the hypotheses that subscales and both scorings of ECP predict VL change and that SMFINAL seems to predict the relationship better than SMCHANGE. However, EE was not found to predict the slope of VL and no relationship was found with the EI subscale within ECP.

Medication Adherence

Self-reported medication adherence was defined as the percentage of missed doses over the previous three days, averaged over the first five time points. Cumulative medication adherence was correlated with subscales of EE and ECP and these correlation values can be found in Tables 13, 14 and 15. Adherence to medication was significantly correlated with positive EE, CA SMFINAL, composite CA/SE SMFINAL, and composite of all ECP SMFINAL subscales. Medication adherence was associated with change in CD4 over time (γ_{16} = -7.267, t (147) = -3.014, p = .003) and to change in VL over time (γ_{16} = 0.030, t (147) = 2.372, p = .019). When controlling for medication

adherence, significant relationships of PS, ECPfinal and ECPchange in the main analyses for both CD4 and VL change remained significant, although significance was slightly reduced for most of these subscales (see Tables 10 and 12). For CD4 specifically, the significant relationship of EEpos became a trend and EI remained significant when controlling for adherence. For VL specifically, both scoring methods of CA and SE as well as both scoring methods for the composite scores of these variables remained significant when controlling for adherence. The strength of the relationships after controlling for adherence in VL models mostly stayed the same or became slightly stronger. As for CD4, the strength of relationships after controlling for adherence decreased.

Objective 2: To determine if EE & ECP predict Category B symptoms, specifically:

e) To determine if emotional expression predicts Category B symptoms.

f) To determine if SMCHANGE for ECP predicts Category B symptoms.

g) To determine if SMFINAL for ECP predicts Category B symptoms.

h) To determine if one scoring method for ECP better predicts Category B symptoms than the other.

Hypothesis 2: EE and both scorings of ECP will predict Category B symptoms, but SMFINAL will predict the relationship better than SMCHANGE.

Prediction to Change in Category B symptoms Over Time

Basic Model

At baseline, 92% of participants reported experiencing no Category B symptoms in the previous month. Table 16 displays the basic model results and significance tests for the change in reported Category B symptoms over time, controlling for antiretroviral medications, time since baseline and baseline Category B symptoms. The slope of

Category B symptoms significantly increases over time (γ_{10}) when controlling for the covariates. This increase was found to occur above and beyond the effects of medications, gender, SES, and ethnicity. Individual variation within change in Category B symptoms (slope) was significant (χ^2 (163) = 253.04, $p < .001$).

Covariates

At level one, there no significant relationships (see Table 12). At level 2, higher education, older age, and baseline reported Category B symptoms (trend) were significantly related to a decrease in reported Category B symptoms over time.

The Contribution of EE and Both Scoring methods of ECP (SMFINAL vs. SMCHANGE)

Significance tests for the predictive ability of emotional expression (EE) and emotional/cognitive processing (ECP) on the change in reported Category B symptoms over time are displayed in Table 17. In terms of EE, higher number of total EE words (γ_{16}) and positive EE words (γ_{16}) used in essays predicted a Category B symptoms decrease over time, but no relationship was found with number of negative EE words. For ECP, Category B symptoms decreased for participants who exhibited higher final scores (SMFINAL) and change scores (SMCHANGE) scores for cognitive appraisal (CA; γ_{16}) and self-esteem (SE; γ_{16}; SEfinal is a trend). Category B symptoms also decreased with higher levels of problem solving (PS; γ_{16}) and experiential involvement (EI; γ_{16}). When SMFINAL and SMCHANGE ECP composite scores were run in the model, all composites were significant predictors of decease in Category B symptoms, and it was found that SMCHANGE seems to predict change in Category B symptoms better than SMFINAL.

Interpretation

These findings support the hypotheses that EE and both scorings of ECP predict slope of Category B symptoms, but do not support the hypothesis that SMFINAL would predict slope better than SMCHANGE. SMCHANGE seems to be a better predictor than SMFINAL for reported physical symptom change over time.

Objective 3: To determine if EE & ECP predict psychological well-being (measured by depression and anxiety levels), specifically:

e) To determine if EE predicts psychological well-being.

f) To determine if SMCHANGE for ECP predicts psychological well-being.

g) To determine if SMFINAL for ECP predicts psychological well-being.

h) To determine if one scoring method for ECP better predicts psychological well-being better than the other.

Hypothesis 3: EE & both scorings of ECP will predict psychological well-being, but SMFINAL will predict the relationship better than SMCHANGE.

Prediction to BDI Change Over Time

Basic Model

Table 18 displays the basic model results and significance tests for the change in Beck Depression Inventory (BDI) levels over time, controlling for antiretroviral medications, time since baseline and baseline BDI. BDI slope did not significantly change over time (γ_{10}) when controlling for the covariates. The HLM base model for BDI shows that the average BDI for participants upon study entry is 10.63, which increased at a rate of 0.016 points per month or 0.2 points per year. This increase was

found to occur above and beyond the effects of medications, gender, SES, and ethnicity. Individual variation within change in BDI (slope) was significant (χ^2 (161) = 341.61, $p <$ .001).

Covariates

At level one, there are no significant changes in BDI that are due to being prescribed medication. At level 2, older age was significantly related to the BDI increase over time.

The Contribution of EE and Both Scoring methods of ECP (SMFINAL vs. SMCHANGE)

Significance tests for the predictive ability of emotional expression (EE) and emotional/cognitive processing (ECP) on the change in BDI over time are displayed in Table 19. In terms of EE, no relationship was found with number of negative EE words, positive EE words or total EE words used in essays. For ECP, BDI decreased when participants had a higher PS score (γ_{16}; trend), but no relationships were found with change or final scores (SMFINAL or SMCHANGE) for cognitive appraisal (CA) or self-esteem (SE) subscales, nor for the experiential involvement (EI) subscale (γ_{16}). When SMFINAL and SMCHANGE ECP composite scores were run in the model, none of the models were significant, although SMFINAL models were closer to significance than were the SMCHANGE models.

Interpretation

These findings do not support the hypotheses that EE and both scorings of ECP would predict BDI changes. However, when looking closer at *p* values, SMFINAL

subscales are closer to a significant *p* value than are SMCHANGE subscales. The only ECP relationship found was with the PS subscale, which was found only to be a trend.

Prediction to STAI Change Over Time

Basic Model

Table 20 displays the basic model results and significance tests for the change in STAI over time, controlling for antiretroviral medications, time since baseline and baseline STAI. STAI slope does not significantly change over time (γ_{10}) when controlling for the covariates. The HLM base model for STAI shows that the average STAI for participants upon study entry is 38.48, which increased at a rate of 0.143 points per month or 1.716 points per year. This increase was found to occur above and beyond the effects of medications, gender, SES, and ethnicity. Individual variation within change in STAI (slope) was significant (χ^2 (161) = 327.45, $p < .001$).

Covariates

At level one, there is a significant decrease in STAI that is related to changes in both combination therapy and HAART over time (see Table 20). At level 2, higher education predicted lower STAI scores.

The Contribution of EE and Both Scoring methods of ECP (SMFINAL vs. SMCHANGE)

Significance tests for the predictive ability of emotional expression (EE) and emotional/cognitive processing (ECP) on the change in STAI over time are displayed in Table 21. In terms of EE, no relationship was found with number of negative EE words, positive EE words or total EE words used in essays. For ECP, no relationship was found with any of the subscales, scoring methods or composite variables.

Interpretation

These findings do not support the hypotheses that subscales and both scorings of ECP predict STAI change. However, when looking closer at *p* values, SMFINAL subscales are closer to a significant *p* value than are SMCHANGE subscales.

Prediction to Combined BDI and STAI Change Over Time

Basic Model

BDI and STAI were correlated at each time point and were found to be significantly related. They were then converted into z-scores and combined into an average composite score for each time point. Table 22 displays the basic model results and significance tests for the change in combined BDI and STAI levels over time, controlling for antiretroviral medications, time since baseline and baseline combined BDI and STAI. Combined BDI and STAI slope significantly increases over time (γ_{10}) when controlling for the covariates. This increase was found to occur above and beyond the effects of medications, gender, SES, and ethnicity. The HLM base model for combined BDI and STAI shows that the average combined BDI and STAI for participants upon study entry is -0.026, which increased at a rate of 0.019 per month or 0.228 per year. This increase was found to occur above and beyond the effects of medications, gender, SES, and ethnicity. Individual variation within change in combined BDI and STAI was significant (χ^2 (161) = 372.32, $p < .001$).

Covariates

At level one, there is a significant decrease in combined BDI and STAI scores that is related to changes in HAART medication over time (see Table 22). At level 2, higher education was significantly related to combined BDI and STAI score decrease.

The Contribution of EE and Both Scoring methods of ECP (SMFINAL vs. SMCHANGE)

Significance tests for the predictive ability of emotional expression (EE) and emotional/cognitive processing (ECP) on the change in combined BDI and STAI scores over time are displayed in Table 23. In terms of EE, no relationship was found for number of negative EE words, positive EE words or total EE words used in essays. For ECP, no relationship was found for any of the subscales, scoring methods or composite variables.

Interpretation

These findings do not support the hypotheses that EE and both scorings of ECP predict combined BDI and STAI score change. However, although not significant, SMFINAL scores on CA and SE are closer to significance than are SMCHANGE scores, as shown by individual subscales and ECP composite models (γ_{16}).

Objective 5: To determine if ECP mediates the relationship between EE and psychological well-being.

Hypothesis 5: ECP mediates the relationship between EE and psychological well-being.

Mediation Analyses for Models with Significant Prediction from EE

Originally, as stated in Objective 5, the objective was to run meditational analyses to explore the potential meditational role of ECP in the relationship between EE and

combined BDI and STAI. However, due to the non-significance of relationships between EE and combined BDI and STAI, meditational analyses were run to examine the potential meditational role of ECP in the significant relationships between EE and other outcomes. In the main analyses, positive EE was the only EE subscale that was found to be significantly related to slope of only two of the outcome variables: CD4 and Category B symptoms (see Tables 24 and 25). Meditational analyses were run to determine the possible mediating role of emotional/cognitive processing (ECP) between positive EE and CD4 and between positive EE and Category B symptoms outcomes. For CD4 (Table 24), as hypothesized for mediation, positive EE became an insignificant predictor of CD4 change when run in the model with individual ECP subscales. When both positive EE and the experiential involvement (EI) subscale of ECP were examined together as predictors of CD4 controlling for adherence, only EI remained significant. Therefore, there is support for EI as a mediator of the relationship between positive EE and CD4. In terms of Category B symptoms (Table 25), when both positive EE and subscales of ECP were examined together as predictors of Category B symptoms, positive EE remained significant in the model and subscales of ECP became non-significant. Therefore, there is support for positive EE as a mediator between ECP and Category B symptoms. Positive EE was a stronger mediator of the relationship between SMFINAL subscales and Category B symptoms than it was in the relationship between SMCHANGE subscales and Category B symptoms. This supports the finding that SMCHANGE scores on subscales of ECP are more closely related to slope of Category B symptoms than SMFINAL.

Chapter 5. Discussion

Emotional Expression

These results provide evidence that higher levels of engagement in positive emotional expression (EE) and emotional/cognitive processing (ECP) contribute to beneficial changes in health outcome measures over time in an HIV+ population. Specifically, higher levels of positive EE predicted increases in CD4 levels and decreases in Category B symptoms over time, but no relationship was found between positive EE and VL, BDI, STAI, or combined BDI and STAI. Interestingly, it was only positive EE that was related to the slope of CD4 and Category B symptoms and amount of negative EE was not related to slope of any outcome measure. This is supported in previous research using participants from our sample by O'Cleirigh et al. (2003), who found a significant relationship between positive EE and CD4 and no relationship between negative EE and CD4, but this was found for women only. Again within women only, he also found that positive EE was significantly related to VL; this relationship was not established in our current study. In other research, significant relationships between emotional expression and beneficial changes in immune control have been found in studies using other medical populations, such as patients with Epstien-Barr Virus (Esterling et al., 1994). However, Petrie et al. (2004) found that HIV+ participants who engaged in an emotional expression writing intervention experienced improvements in CD4 and VL at a one-month follow up but these relationships failed to show during further follow up assessments. It is important to note that these previous two studies used an emotional writing intervention whereas our study uses a single measure of EE and ECP. Considering these findings and specifically findings by O'Cleirigh et al. (2003),

our results that are showing a relationship between positive EE and CD4 slope are supported, but it is unclear why no relationship was found between EE and VL log.

Emotional/Cognitive Processing

Within ECP, higher levels of engagement in ECP were related to improvements over time in CD4 cell count, VL and Category B symptoms but not to BDI, STAI or the combination of BDI and STAI scores. To our knowledge, our finding of a significant influence of ECP on change in Category B symptoms over time is the first time this relationship has been demonstration. O'Cleirigh et al. (2003) found ECP to be significantly related to CD4 as well, but this was found only in women and the investigators only analyzed SMCHANGE for ECP. In a study by Bower et al. (1998), HIV+ men who engaged in ECP after a loss experienced increased CD4 levels over time when compared to those who used less ECP. In terms of VL, O'Cleirigh et al. (2003) did not find a significant relationship between ECP and VL, although a significant relationship between EE and VL was found in our current study. Note that O'Cleirigh (2004) used the change score on ECP and found that it was significantly related to change in CD4 and VL over two years. However, because he only used the change scoring method, it was impossible to know how a change score on ECP would compare to use of a final scoring method for rating of the essays.

In terms of a final score (SMFINAL) versus a change score (SMCHANGE) for ECP subscales, our results suggest that SMFINAL within ECP may be a better predictor of CD4 and VL log slope than SMCHANGE, as indicated by lower *p* value. To support this, when composite scores reflecting SMFINAL versus SMCHANGE of all four subscales of ECP were run in the models, SMFINAL composite scores predicted slope of

CD4 and VL better than SMCHANGE. Within Category B symptoms, SMCHANGE predicted change in symptoms over time better than SMFINAL, which did not support our hypothesis and may indicate that there is something unique about the Category B symptoms slope that is better predicted by amount of change in cognitive appraisal (CA) and self-esteem (SE) than a final score on these subscales. Within BDI and STAI slopes, although no significant relationships were found with subscales of ECP, it may be of interest to note that significance levels of ECP SMFINAL were closer to the $p < .05$ value than were the SMCHANGE scores.

Two ECP subscales, problem-solving (PS) and experiential involvement (EI), did not have SMFINAL and SMCHANGE values and were only scored one way. Higher levels of PS were significantly related to an increase in CD4 and decrease in VL log over time, but not to change in any other outcome. The PS subscale measures the level of action a person has taken to improve their situation. A high score on this scale indicates that the individual has taken an action to solve a problem and has experienced improvement in their situation as a result. Conceptually, an improvement in a stressful situation would result in less related stress, and stress has been shown to adversely affect the immune system within HIV (Leserman, 2008). This may explain the relationship between PS and CD4 slope as well as PS and VL slope. In terms of EI, higher levels on this subscale were significantly related to improvements in CD4 levels over time and less report of Category B symptoms over time, but were not found to be related to change in any other outcome. The EI subscale measures the extent to which a participant was involved in the emotional writing task, as indicated by following directions and willingness to disclose.

Mediational Findings for CD4 and Category B Symptoms

Positive EE was not related to VL, BDI, STAI, or combined BDI and STAI, but was related to CD4 and Category B symptoms. Mediational analyses were run to explore the mediating role of ECP between positive EE and CD4 slope as well as positive EE and Category B symptoms slope. When testing for mediation by ECP in these relationships, findings varied between the two outcomes. It was hypothesized that ECP would mediate the relationship between positive EE and slope of these outcomes, and this was supported within the relationship between positive EE and CD4 slope. When both positive EE and the experiential involvement (EI) subscale of ECP were examined together as predictors of slope of CD4 controlling for adherence, only EI remained significant, which supports EI as a mediator in the relationship. This means that positive EE allows for more involvement in emotional writing, which leads to more benefits in CD4 change. O'Cleirigh et al. (2003) also found that ECP was a mediator in the relationship between EE and "long-term survival" of HIV+ participants who had lived four years past an AIDS-defining infection prior to starting protease inhibitors. These findings were again supported in a subsequent study that he conducted in which he found that ECP mediated the relationship between EE and a group of participants with AIDS who were asymptomatic despite low (<50) CD4 count (O'Cleirigh et al., 2008).

Within the relationship between positive EE and Category B symptoms, ECP was not found to be a mediator. When both positive EE and subscales of ECP were examined together as predictors of slope of Category B symptoms, positive EE remained significant in the model and subscales of ECP became non-significant. Therefore, there is support for positive EE as a mediator between ECP and slope Category B symptoms, which is not

what was hypothesized. These meditational findings for Category B symptoms do not support the original hypothesis that ECP would serve a meditational role, but provide evidence that the use of positive words may be a more influential action than engagement in ECP when predicting Category B symptoms slope, and engagement in ECP may even facilitate the use of positive EE. In addition, positive EE was a stronger mediator of the relationship between SMFINAL subscales and Category B symptoms than it was in the relationship between SMCHANGE subscales and Category B symptoms. This provides additional support for the finding that SMCHANGE scores on subscales of ECP are more closely related to slope of Category B symptoms than SMFINAL.

Category B Symptoms Outcome Variable

It is of interest to discuss the Category B symptoms outcome variable in relation to the findings that were not as expected in two areas. First, scoring the cognitive appraisal and self-esteem subscales using SMCHANGE predicted Category B symptoms slope better than SMFINAL on these subscales. It was hypothesized that SMFINAL would be more significantly related to outcomes, which was found for CD4 or VL slope. In terms of SMCHANGE being more significantly related to slope of Category B symptoms than SMFINAL, it may be that someone who experiences a drastic positive change in CA and SE after an event feels better because of this change, and is less likely to report physical symptoms than someone who has experienced little change, even though the second subject may have a constant, high score on ECP. It would seem to make sense that this large, positive change in processing would cause someone to report less physical symptoms but would not affect CD4 or VL as much as a constant, high functioning state.

Secondly, positive EE mediated the relationships between ECP and slope of Category B symptoms, rather than ECP mediating the relationship between EE and Category B symptoms slope. It was hypothesized that ECP would mediate the relationship between positive EE and outcomes, which was found for CD4 slope. Category B symptoms seems to be a health-related variable, so it is interesting that within prediction to CD4 slope, ECP was a mediator whereas positive EE is the mediator in Category B symptoms slope. This difference may be accounted for by the self-report nature of the Category B symptoms variable, which may make it an unreliable measure. In addition, it may be that change in Category B symptoms happens over a shorter time period than change in CD4 or VL, which may be why positive EE is more influential than the more involved, deeper processing tasks of ECP.

Medication Adherence

In this study, anti-HIV medication adherence predicted increases in CD4 and decreases in VL over time. However, Ironson et al. (2005) found adherence to only be related to VL and not CD4. Most significant relationships between predictors and change in outcomes remained significant when controlling for adherence, in our study and in Ironson et al. (2005). Within VL change in our study, the strength of the significant relationships with predictors either stayed the same or became slightly stronger after controlling for adherence, while the strength of the relationships within CD4 change decreased.

BDI & STAI

The hypotheses that significant relationships would be found between EE/ECP and BDI, STAI, and combined BDI and STAI were not supported due to non-significant results within these outcome models. This does not support previous literature and findings that emotional writing is related to beneficial changes in depression and anxiety (Frattaroli, 2006; Gortner et al., 2006; Graf et al., 2008; Hemenover, 2003; Lepore, 1997; Smyth, 1998), but it is important to note that these previous studies used different medical or non-medical populations and utilized data from emotional writing interventions, whereas we measured EE and ECP at a single time point within an HIV+ population.

Base Models

Within the base models for each outcome variable, it should be noted that the slopes of VL, BDI and STAI were found to be non-significant. This means that VL, BDI and STAI levels did not significantly change over time. This could explain why significant relationships were not found between EE/ECP and slope of BDI nor between EE/ECP and slope of STAI, and only ECP was related to slope of VL. There was a significant slope of combined BDI and STAI even though BDI and STAI separately did not have significant change over time. In addition, the combined BDI and STAI outcome base model showed a non-significant intercept, which means the baseline combined BDI and STAI did not significantly differ from zero. This may contribute the lack of significant relationships between EE/ECP and combined BDI and STAI.

Chapter 6. Clinical Implications

Clinically, the findings of this study suggest that a higher level of positive emotional expression words used when discussing a traumatic event may be linked to beneficial changes in health, which can be applied to trauma treatment psychotherapy. It is wise for practitioners to consider this relationship when providing services to patients. However, it is possible that the act of encouraging patients to use positive emotional expression for health improvements may set unattainable expectations for some patients, which could lead to negative consequences. It is important first and foremost, to keep the patient's best interest in mind.

In addition, in terms of physical symptoms reported by individuals with HIV, a larger decrease may be seen in individuals who experience greater positive change in cognitive appraisals and self-esteem after a trauma. Evidence of the study also suggests that high cognitive appraisal and self-esteem at the point of measurement positively influence CD4 and VL levels. It may be beneficial for practitioners to help patients to work towards adjusting cognitive appraisals to become more positive/realistic and achieving better self-esteem. These changes can occur through repeated emotional writing about the traumatic event, as well as through cognitive-behavioral therapy.

Chapter 7. Limitations and Future Directions

Limitations of the current study include several. First, although our study was based on the same sample used by Ironson et al. (2005), there were minor differences in mean, standard deviation and base model values for CD4 and VL, as well as minor differences in mean and standard deviation for medication adherence between the studies. These differences could be explained by the new version of the HLM program (HLM6), which calculates values slightly differently than the previous version did, which is what Ironson et al. (2005) use for analyses (M. du Toit, personal communication, April 7, 2011). Another explanation for these differences could be that there was a slightly different sample size between the studies. Upon gathering 177 cases of participant data used by Ironson et al. (2005), it was realized that her data overlapped with only 169 of the participants for whom we had essay data. Therefore, the differences between the studies in descriptive and base model values for CD4, VL and adherence can be explained by the additional 8 subjects used in her study; it is possible one or two of those subjects had outlier values for the above variables and these values were not in our analyses. It would make sense that the differences in variable values between studies may also have contributed to the findings that adherence was related to CD4 and VL in the current study when Ironson et al. (2005) found adherence to only be related to VL. It would be beneficial for a future study to locate the missing 8 cases in order to identify their values on CD4, VL and medication adherence to determine if that is in fact the reason for the difference in values between studies. It might also be beneficial to locate essays for the dropped 8 cases and score them to reach a sample size of 177, although this could confound results by adding another, separate round of essay scoring.

Other limitations of the current study relate to the scoring of essays. The raters in this study found it hard to determine a change score and final score for each essay due to varying lengths and details in the writing. This was especially hard in determining change scores for ECP because raters need information about the past and present levels of cognitive appraisal and self-esteem. Many times, the subjects wrote about either their current feelings about the trauma or only their feelings immediately after, which made it difficult to identify two time points needed to calculate a change in cognitive appraisals and self-esteem. In these cases, the same values were used and the change was determined as very low, although the actual change could have been high but was not disclosed. In addition, essay scoring is highly subjective, and ratings could vary with different training groups. Different relationships between EE/ECP and slope of VL and CD4 were found in this study compared to what was found by O'Cleirigh et al. (2003), although the same scoring method for EE and ECP (SMCHANGE) was used on some of the same sample of essays. The difference in results may be due to the new generation of scorers.

In a future study, if attempting to score for change in ECP, it would be beneficial to directly ask patients to describe their change in appraisals and self-esteem, and to review their writing after the session. However, since findings of this study suggested that a final score of ECP is a better predictor of change in CD4 and VL outcomes and a change score of ECP is a better predictor of Category B symptoms, it would be beneficial for future studies to explore the relationship between final ECP scores and health outcomes. As far as overall essay rating, it would be beneficial in future studies to ensure

that the essay scores from new raters are highly correlated with essay scores from original raters. If differences were found, it would be necessary to provide more training until correlations were high.

Another limitation may be seen in that the Category B symptoms outcome variable was highly skewed due to a large majority of participants who did not report symptoms. It is possible that this skewness may have contributed to the significant findings within this variable, and may explain the findings that did not support the hypotheses, such as the predictive power of SMCHANGE over SMFINAL and the meditational role of positive EE between ECP and Category B symptoms. It would be beneficial to take a closer look at this outcome to determine why relationships with predictors are different than with CD4 and VL.

Pertaining to the non-significant relationships between EE/ECP and BDI as well as EE/ECP and STAI, it would be beneficial to further explore these variables to determine why no relationships with predictors were found. A cross-sectional analysis with these outcomes and predictors could give a better picture of possible relationships, and other statistical methods could be used. In addition, there may be a better way to combine these variables and this could also be explored in future analyses.

Chapter 8. Conclusion

In summary, these results provide evidence that higher levels of engagement in positive emotional expression (EE) and emotional/cognitive processing (ECP) during an emotional writing intervention after a trauma contribute to beneficial changes in measures of health over time in an HIV+ population. The results also suggest that a final score for ECP may be a better predictor than a change score for CD4 change over time, but a change score for ECP may be a better predictor than a final score for Category B symptoms change over time. These findings contribute to previous literature on emotional writing interventions within HIV+ populations, and it would be beneficial for future studies to further explore these relationships. Overall, patients may benefit from utilizing more positive emotional expression when discussing traumatic events.

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Figure 1. Mean BDI-II Score for Participants at Each Time Point

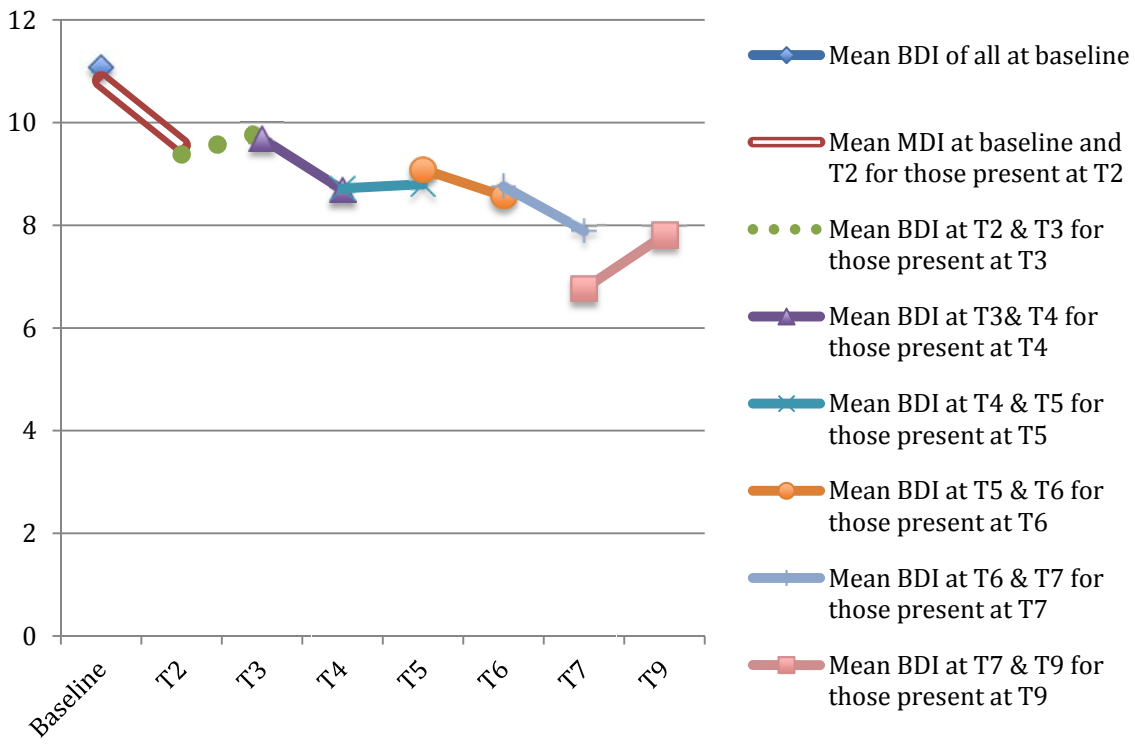

Table 1. Emotional Expression & Emotional/Cognitive Processing Scores: Preliminary Inter-Rater Reliability (Pulled from a different sample of EW essays)

Construct Scored	*n*	*r*	*p*
Emotional Expression			
Positive Words	14	.865**	.000
Negative Words	14	.910**	.000
Total Words	14	.895**	.000
Emotional/Cognitive Processing			
Cogn. Appraisal (Final score)	14	.737**	.003
Self-Esteem (Final score)	14	.807**	.000
Problem-Solving	14	.802**	.001
Experiential Involvement	14	.753**	.002

* = $p < .05$, ** = $p < .01$

Table 2. Emotional Expression & Emotional/Cognitive Processing Scores: Inter-Rater Reliability Round 1

Construct Scored	*n*	*r*	*p*
Emotional Expression			
Positive Words	25	.967**	.000
Negative Words	25	.980**	.000
Total Words	25	.984**	.000
Emotional/Cognitive Processing			
Cogn. Appraisal (Change score – SMCHANGE)	25	.919**	.000
Cogn. Appraisal (Final score – SMFINAL)	25	.872**	.000
Self-Esteem (Change score – SMCHANGE)	25	.901**	.000
Self-Esteem (Final score – SMFINAL)	25	.784**	.000
Problem-Solving	25	.967**	.000
Experiential Involvement	25	.867**	.000

* = $p < .05$, ** = $p < .01$

Table 3. Emotional Expression & Emotional/Cognitive Processing Scales: Inter-rater Reliability Round 2

Construct Scored	*n*	*r*	*p*
Emotional Expression			
Positive Words	26	.938**	.000
Negative Words	26	.962**	.000
Total Words	26	.965**	.000
Emotional/Cognitive Processing			
Cogn. Appraisal (Change score – SMCHANGE)	26	.937**	.000
Cogn. Appraisal (Final score – SMFINAL)	26	.880**	.000
Self-Esteem (Change score – SMCHANGE)	26	.854**	.000
Self-Esteem (Final score – SMFINAL)	26	.884**	.000
Problem-Solving	26	.978**	.000
Experiential Involvement	26	.944**	.000

* = $p < .05$, ** = $p < .01$

Table 4. Essay Topic Frequency by Category

Topic Category	*n*	*%*
HIV Diagnosis	126	57.5
HIV Stats Disclosure	23	10.5
General HIV-Related Stress	17	7.8
Death of a Loved One	20	9.1
Relationship Issues	10	4.6
Other*	23	10.5

*The "other" category includes small numbers of people who wrote about the following topics: child leaving home, pregnancy, illness/accident, substance abuse/dependence, employment stress, son in prison, coming to terms with homosexuality, immigration, and dental work. Two subjects did not mention a topic in their essay and were labeled as "other."

Table 5. Means and Standard Deviations of EE and ECP predictor variables (N = 169)

Predictor	*Mean*	*SD*
Emotional Expression		
Positive words (EEpos)	1.42	1.94
Negative words (EEneg)	3.40	2.87
Total words (EEtot)	4.80	3.86
Emotional/cognitive processing		
Cognitive appraisal (CA) - SMfinal	4.28	1.44
Cognitive appraisal - SMchange	2.76	1.60
Self-esteem (SE) - SMfinal	4.33	1.11
Self-esteem - SMchange	2.28	1.33
Problem solving (PS)	4.18	1.83
Experiential Involvement (EI)	3.54	1.45

Table 6. Means and Standard Deviations for Outcome Measures at Baseline (n= 169)

	Mean	*SD*
CD4	299.31	102.45
Log VL	3.58	1.10
BDI	11.08	8.77
STAI	39.61	12.90
Combined BDI & STAI (z-scores)	-0.03	0.87
Physical Symptoms	0.06	0.24

Table 7. Cumulative Means and Standard Deviations for BDI, STAI, Combined BDI and STAI, Physical Symptoms, and Adherence

	Mean	*SD*
BDI	9.59	6.96
STAI	38.24	9.86
Combined BDI & STAI (z-scores)	0.02	0.71
Physical Symptoms	0.11	0.18
Adherence	0.09	0.16

Table 8. The Interrelationship (Pearson correlations) Between Subscales of EE and ECP (SMFINAL and SMCHANGE)

Measures	1	2	3	4	5	6	7	8	9
1. CA Final	--	.713**	.698**	.623**	.694**	.438**	.524**	.115	.353**
2.CAChange		--	.441**	.794**	.652**	.455**	.391**	.239**	.376**
3. SE Final			--	.635**	.415**	.169*	.475**	-.155*	.127
4. SEChange				--	.534**	.382**	.460**	.172*	.362**
5. PS					--	.434**	.439**	.249**	.410**
6. EI						--	.514**	.634**	.732**
7. EEpos							--	.253**	.870**
8. EEneg								--	.695**
9. EEtot									--

** = Correlation is significant at the $p < .01$ level

* = Correlation is significant at the $p < .05$ level

Table 9. Basic Model including Coefficients and Significance Tests for Level 1 and Level 2 Covariates in Prediction of CD4 Slope over 4 Years

	Coefficient	Standard Error	*t* Ratio	*df*	*p*
Fixed effects					
CD4 intercept, β_0					
Average initial CD4, y_{00}	271.523	15.098	17.984	168	.000
CD4 slope (per month), β_1					
Average slope, γ_{10}	-7.092	2.010	-3.527	163	.001
Baseline CD4/mm3 y_{11}	0.009	0.003	2.758	163	.007
Age, γ_{12}	0.015	0.039	0.388	163	.698
Gender, γ_{13}	0.452	0.902	0.501	163	.617
Ethnicity, γ_{14}	-0.944	0.851	-1.109	163	.269
Education, γ_{15}	1.039	0.296	3.507	163	.001
Antiretroviral 1 increment, β_2					
Average increment, γ_{20}	69.288	18.924	3.661	967	.000
Antiretroviral 2 increment, β_3					
Average increment, γ_{30}	37.444	15.251	2.455	967	.014
Antiretroviral 1 increment over time, β_4					
Average increment over time, γ_{40}	0.047	0.975	0.048	967	.962
Antiretroviral 2 increment over time, β_5					
Average increment over time, γ_{50}	1.291	0.700	1.844	967	.065
Random effects	SD	Variance	df	χ^2	*p* Value
Intercept, U_0	96.116	9238.332	168	640.751	.000
Slope, U_1	3.837	14.725	163	560.041	.000
Error, *R*	78.618	6180.842			

Table 10. Prediction from EE/ECP Variables to CD4 Slope (A) with Additional Control for Antiretroviral Medication Adherence (B)

Predictor	(A) Main Analyses (n = 169)			(B) Main analyses with additional control for medication adherence (n = 154)		
	γ16 γ coefficient	t Ratio	p	γ17 γ coefficient	t Ratio	p
EE						
EEpos	0.381	2.184	.030	0.331	1.771	.078
EEneg	0.110	0.821	.413	0.105	0.717	.474
EEtot	0.163	1.782	.076	0.148	1.463	.146
ECP						
CAfinal	0.500	1.923	.056	0.405	1.415	.159
CAchange	0.423	1.763	.079	0.405	1.564	.120
SEfinal	0.611	1.760	.080	0.565	1.550	.123
SEchange	0.414	1.345	.181	0.455	1.357	.177
PS	0.456	2.406	.017	0.391	2.004	.047
EI	0.585	2.646	.009	0.622	2.729	.008
ECP Composites						
CA&SE final	26.38	2.055	.041	0.699	1.572	.118
CA&SE change	0.686	1.618	.107	0.705	1.522	.130
All ECP final	1.290	2.814	.006	1.184	2.438	.016
All ECP change	1.117	2.456	.015	1.097	2.249	.026

Table 11. Basic Model including Coefficients and Significance Tests for Level 1 and Level 2 Covariates in Prediction of Log Viral Load Slope over 4 Years

	Coefficient	Standard Error	*t* Ratio	*df*	*p*
Fixed effects					
VLlog intercept, β_0					
Intercept, γ_{00}	4.468	0.117	38.115	168	.000
VLlog slope (per month), β_1					
Average slope, γ_{10}	0.012	0.012	1.015	163	.312
Baseline VLlog, γ_{11}	0.001	0.002	0.512	163	.609
Age, γ_{12}	-0.000038	0.00024	-0.158	163	.875
Gender, γ_{13}	-0.003	0.004	-0.656	163	.512
Ethnicity, γ_{14}	0.004	0.005	0.847	163	.398
Education, γ_{15}	-0.004	0.001	-2.774	163	.007
Antiretroviral 1 increment, β_2					
Average increment, γ_{20}	-1.087	0.152	-7.169	952	.000
Antiretroviral 2 increment, β_3					
Average increment, γ_{30}	-1.134	0.150	-7.568	952	.000
Antiretroviral 1 increment over time, β_4					
Average increment over time, γ_{40}	0.009	0.006	1.419	952	.156
Antiretroviral 2 increment over time, β_5					
Average increment over time, γ_{50}	0.002	0.005	0.344	952	.731
Random effects	SD	Variance	df	χ^2	*p* Value
Intercept, U_0	0.902	0.814	168	840.410	.000
Slope, U_1	0.016	0.0003	163	288.282	.000
Error, *R*	0.631	0.398			

Table 12. Prediction from EE/ECP Variables to Log Viral Load Slope (A) with Additional Control for Antiretroviral Medication Adherence (B)

Predictor	(A) Main Analyses (n = 169)			(B) Main analyses with additional control for medication adherence (n = 154)		
	γ16 γ coefficient	*t* Ratio	*p*	γ17 γ coefficient	*t* Ratio	*p*
EE						
EEpos	-0.001	-1.235	.219	-0.001	-1.145	.255
EEneg	-0.0003	-0.525	.600	-0.000	-0.465	.649
EEtot	-0.001	-1.068	.287	-0.001	-0.974	.332
ECP						
CAfinal	-0.004	-2.513	.013	-0.004	-2.397	.018
CAchange	-0.003	-2.121	.035	-0.003	-2.271	.025
SEfinal	-0.005	-3.070	.003	-0.005	-2.957	.004
SEchange	-0.004	-2.291	.023	-0.004	-2.599	.011
PS	-0.003	-2.252	.026	-0.003	-2.198	.029
EI	-0.002	-1.436	.153	-0.002	-1.533	.122
ECP Composites						
CA&SE final	-0.006	-2.961	.004	-0.006	-2.837	.006
CA&SE change	-0.005	-2.234	.021	-0.006	-2.586	.011
All ECP final	-0.008	-2.982	.004	-0.008	-2.953	.004
All ECP change	-0.006	-2.498	.014	-0.007	-2.691	.008

Table 13. The Interrelationship (Pearson correlations) Between Self-Reported Antiretroviral Medication Adherence (ATCG; n = 154) and EE

Measures	1	2	3	4
1. Adherence	--	-.182*	-.066	-.142
2. EEpos		--	.248**	.704**
3. EEneg			--	.861**
4. EEtot				--

** = Correlation is significant at the $p < .01$ level

* = Correlation is significant at the $p < .05$ level

Table 14. The Interrelationship (Pearson correlations) Between Self-Reported Antiretroviral Medication Adherence (ATCG; n = 154) and ECP (SMFINAL and SMCHANGE)

Measures	1	2	3	4	5	6	7
1. Adherence	--	-.176*	-.049	-.172	.023	-.134	-.032
2. CAfinal		--	.724**	.725**	.636**	.708**	.405**
3. CAchange			--	.464**	.783**	.652**	.451**
4. SEfinal				--	.657**	.446**	.156
5. SEchange					--	.526**	.383**
6. PS						--	.439**
7. EI							--

** = Correlation is significant at the $p < .01$ level

* = Correlation is significant at the $p < .05$ level

Table 15. The Interrelationship (Pearson correlations) Between Self-Reported Antiretroviral Medication Adherence (ATCG; n = 154) and Composite Scores of ECP (SMFINAL and SMCHANGE)

Measures	1	2	3	4	5
1. Adherence	--	-.187*	-.014	-.165*	-.059
2. CA&SE final		--	.706**	.891**	.696**
3. CA&SE change			--	.762**	.913**
4. All ECP final				--	.898**
5. All ECP change					--

** = Correlation is significant at the $p < .01$ level

* = Correlation is significant at the $p < .05$ level

Table 16. Basic Model including Coefficients and Significance Tests for Level 1 and Level 2 Covariates in Prediction of Category B Symptoms slope over 4 Years

	Coefficient	Standard Error	*t* Ratio	*df*	*p*
Fixed effects					
CatB intercept, β_0					
Average initial CatB, y_{00}	-2.397	0.249	-9.611	168	.000
CatB slope (per month), β_1					
Average slope, γ_{10}	0.050	0.020	2.527	163	.013
Baseline CatB/mm3 y_{11}	-0.036	0.021	-1.731	163	.085
Age, γ_{12}	-0.001	0.000	-2.084	163	.038
Gender, γ_{13}	-0.006	0.009	-0.695	163	.488
Ethnicity, γ_{14}	0.010	0.009	1.100	163	.273
Education, γ_{15}	-0.005	0.003	-1.855	163	.065
Antiretroviral 1 increment, β_2					
Average increment, γ_{20}	0.226	0.372	0.608	960	.543
Antiretroviral 2 increment, β_3					
Average increment, γ_{30}	0.446	0.286	1.559	960	.119
Antiretroviral 1 increment over time, β_4					
Average increment over time, γ_{40}	-0.013	0.020	-0.655	960	.512
Antiretroviral 2 increment over time, β_5					
Average increment over time, γ_{50}	-0.019	0.016	-1.151	960	.250
Random effects	SD	Variance	df	χ^2	*p* Value
Intercept, U_0	2.015	4.058	168	423.77	.000
Slope, U_1	0.080	0.006	163	253.04	.000
Error, *R*	0.619	0.383			

Table 17. Prediction from EE/ECP Variables to Category B Symptoms Slope

Predictor	Main Analyses (n = 169)		
	γ16 γ coefficient	*t* Ratio	*p*
EE			
EEpos	-0.007	-4.231	.000
EEneg	-0.001	-0.419	.675
EEtot	-0.002	-2.220	.028
ECP			
CAfinal	-0.006	-2.602	.010
CAchange	-0.006	-3.176	.002
SEfinal	-0.006	-1.717	.087
SEchange	-0.009	-3.080	.003
PS	-0.004	-1.882	.061
EI	-0.007	-2.598	.011
ECP Composites			
CA&SE final	-0.009	-2.226	.027
CA&SE change	-0.012	-3.326	.001
All ECP final	-0.014	-2.703	.008
All ECP change	-0.016	-3.465	.001

Table 18. Basic Model including Coefficients and Significance Tests for Level 1 and Level 2 Covariates in Prediction of BDI over 4 Years

	Coefficient	Standard Error	*t* Ratio	*df*	*p*
Fixed effects					
BDI intercept, β_0					
Average initial BDI, y_{00}	10.628	1.062	10.009	168	.000
BDI slope (per month), β_1					
Average slope, γ_{10}	0.016	0.089	0.180	163	.858
Baseline BDI, y_{11}	0.002	0.002	0.819	163	.414
Age, γ_{12}	0.005	0.002	2.817	163	.006
Gender, γ_{13}	0.003	0.039	0.083	163	.935
Ethnicity, γ_{14}	0.021	0.037	0.560	163	.576
Education, γ_{15}	-0.023	0.015	-1.563	163	.120
Antiretroviral 1 increment, β_2					
Average increment, γ_{20}	-0.664	1.712	-0.388	948	.698
Antiretroviral 2 increment, β_3					
Average increment, γ_{30}	0.010	1.126	0.009	948	.993
Antiretroviral 1 increment over time, β_4					
Average increment over time, γ_{40}	-0.055	0.060	-0.916	948	.360
Antiretroviral 2 increment over time, β_5					
Average increment over time, γ_{50}	-0.054	0.051	-1.046	948	.296
Random effects	SD	Variance	df	χ^2	*p* Value
Intercept, U_0	6.973	48.628	166	684.471	.000
Slope, U_1	0.167	0.028	161	341.616	.000
Error, *R*	5.537	30.653			

Table 19. Prediction from EE/ECP Variables to BDI Slope

Predictor	Main Analyses (n = 169)		
	γ16 γ coefficient	*t* Ratio	*p*
EE			
EEpos	-0.0003	-0.038	.970
EEneg	0.006	1.075	.284
EEtot	0.003	0.780	.437
ECP			
CAfinal	-0.015	-1.057	.293
CAchange	-0.001	-0.113	.911
SEfinal	-0.021	-1.413	.160
SEchange	0.002	0.184	.854
PS	-0.017	-1.693	.092
EI	-0.006	-0.411	.681
ECP Composites			
CA&SE final	-0.026	-1.373	.172
CA&SE change	0.000	0.029	.997
All ECP final	-0.036	-1.478	.141
All ECP change	-0.014	-0.606	.545

Table 20. Basic Model including Coefficients and Significance Tests for Level 1 and Level 2 Covariates in Prediction of STAI Slope over 4 Years

	Coefficient	Standard Error	*t* Ratio	*df*	*p*
Fixed effects					
STAI intercept, β_0					
Average initial STAI, y_{00}	38.477	1.224	31.427	168	.000
STAI slope (per month), β_1					
Average slope, γ_{10}	0.143	0.129	1.109	163	.269
Baseline STAI, y_{11}	0.002	0.002	1.084	163	.280
Age, γ_{12}	0.0001	0.003	0.030	163	.976
Gender, γ_{13}	-0.012	0.052	-0.241	163	.810
Ethnicity, γ_{14}	-0.041	0.053	-0.777	163	.438
Education, γ_{15}	-0.048	0.019	-2.451	163	.016
Antiretroviral 1 increment, β_2					
Average increment, γ_{20}	0.103	1.813	0.057	943	.955
Antiretroviral 2 increment, β_3					
Average increment, γ_{30}	1.021	1.334	0.766	943	.444
Antiretroviral 1 increment over time, β_4					
Average increment over time, γ_{40}	-0.140	0.079	-1.768	943	.077
Antiretroviral 2 increment over time, β_5					
Average increment over time, γ_{50}	-0.151	0.058	-2.584	943	.010
Random effects	SD	Variance	df	χ^2	*p* Value
Intercept, U_0	10.241	104.883	166	642.436	.000
Slope, U_1	0.255	0.065	161	327.447	.000
Error, *R*	8.372	70.098			

Table 21. Prediction from EE/ECP variables to STAI slope

Predictor	Main Analyses (n = 169)		
	γ16 γ coefficient	*t* Ratio	*p*
EE			
EEpos	-0.006	-0.519	.604
EEneg	0.013	1.498	.136
EEtot	0.0049	0.763	.447
ECP			
CAfinal	-0.014	-0.784	.434
CAchange	-0.009	-0.650	.517
SEfinal	-0.032	-1.499	.136
SEchange	-0.011	-0.602	.548
PS	-0.015	-1.023	.308
EI	0.000005	0.000	1.000
ECP Composites			
CA&SE final	-0.033	-1.300	.196
CA&SE change	-0.016	-0.668	.505
All ECP final	-0.035	-1.084	.281
All ECP change	-0.021	-0.679	.498

Table 22. Basic Model including Coefficients and Significance Tests for Level 1 and Level 2 Covariates in Prediction of Combined BDI and STAI Slope over 4 Years

	Coefficient	Standard Error	*t* Ratio	*df*	*p*
Fixed effects					
Combined BDI/STAI intercept, β_0					
Average initial Combined BDI/STAI, y_{00}	-0.026	0.073	-0.264	168	.792
Combined BDI/STAI (per month), β_1					
Average slope, γ_{10}	0.019	0.008	2.282	163	.024
Baseline Combined BDI/STAI y_{11}	0.002	0.002	1.117	163	.266
Age, γ_{12}	0.001	0.000	1.526	163	.129
Gender, γ_{13}	-0.001	0.004	-0.236	163	.814
Ethnicity, γ_{14}	-0.000	0.004	-0.061	163	.952
Education, γ_{15}	-0.003	0.001	-2.265	163	.025
Antiretroviral 1 increment, β_2					
Average increment, γ_{20}	-0.047	0.156	-0.304	944	.761
Antiretroviral 2 increment, β_3					
Average increment, γ_{30}	0.059	0.103	0.572	944	.567
Antiretroviral 1 increment over time, β_4					
Average increment over time, γ_{40}	-0.007	0.006	-1.194	944	.233
Antiretroviral 2 increment over time, β_5					
Average increment over time, γ_{50}	-0.010	0.005	-2.102	944	.036
Random effects	SD	Variance	df	χ^2	*p* Value
Intercept, U_0	0.727	0.529	166	757.03	.000
Slope, U_1	0.018	0.000	161	372.32	.000
Error, *R*	0.538	0.290			

Table 23. Prediction from EE/ECP Variables to Combined BDI and STAI Slope

Predictor	Main Analyses (n = 169)		
	γ16 γ coefficient	t Ratio	p
EE			
EEpos	-0.000	-0.369	.712
EEneg	0.001	1.312	.192
EEtot	0.000	0.758	.450
ECP			
CAfinal	-0.001	-0.888	.376
CAchange	-0.000	-0.338	.735
SEfinal	-0.002	-1.561	.120
SEchange	-0.000	-0.210	.834
PS	-0.002	-1.441	.151
EI	-0.000	-0.183	.856
ECP Composites			
CA&SE final	-0.003	-1.362	.175
CA&SE change	-0.001	-0.290	.772
All ECP final	-0.003	-1.235	.219
All ECP change	-0.001	-0.620	.536

Table 24. Model for Testing the Meditational Role of ECP in the Relationship Between EE Positive and CD4 Change Over Time When Both EE and ECP Predictors are in the HLM Level 2 Model Together (A) with Additional Control for Antiretroviral Medication Adherence (B)

Mediation Models	(A) Main Analyses (n = 169)			(B) Main analyses with additional control for medication adherence (n = 154)		
	γ coefficient	t Ratio	p	γ coefficient	t Ratio	p
EEpos	0.281	1.362	.175	0.259	1.184	.239
CAfinal	0.282	0893	.374	0.213	0.624	.534
EEpos	0.295	1.523	.130	0.245	1.219	.225
	0.284	1.078	.283	0.298	1.073	.285
CAchange						
EEpos	0.287	1.533	.127	0.239	1.213	.288
SEfinal	0.384	0.930	.354	0.390	0.924	.357
EEpos	0.260	1.350	.179	0.222	1.068	.288
PS	0.335	1.591	.113	0.285	1.309	.193
EEpos	0.240	1.242	.216	0.160	0.786	.433
EI	0.412	1.658	.099	0.512	2.040	.043
EEpos	0.262	1.304	.194	0.227	1.067	.288
CA&SE	0.502	.989	.325	0.455	0.846	.399
final						
EEpos	0.137	0.661	.509	0.098	0.450	.653
All	1.067	1.811	.071	1.030	1.686	.094
ECPfinal						
EEpos	0.201	0.950	.344	0.136	0.621	.535
All	0.844	1.496	.136	0.919	1.566	.119
ECPchange						

Table 25. Model for Testing the Meditational Role of ECP in the Relationship Between EE Positive and Category B Symptoms Change Over Time When Both EE and ECP Predictors are in the HLM Level 2 Model Together

Models	γ coefficient	*t* Ratio	*p*
EEpos	-0.006	-3.366	.001
CAfinal	-0.002	-0.699	.486
EEpos	-0.006	-3.320	.001
CAchange	-0.004	-1.809	.072
EEpos	-0.006	-3.373	.001
SEfinal	-0.002	-0.509	.611
EEpos	-0.005	-2.813	.006
SEchange	-0.006	-1.729	.085
EEpos	-0.006	-3.749	.000
PS	-0.001	-0.566	.572
EEpos	-0.005	-2.941	.004
EI	-0.004	-1.200	.232
EEpos	-0.006	-3.155	.002
CA&SE final	-0.003	-0.639	.523
EEpos	-0.005	-2.940	.004
CA&SE change	-0.008	-1.901	.059
EEpos	-0.005	-2.495	.014
All ECPfinal	-0.007	-1.023	.309
EEpos	-0.005	-2.511	.013
All ECPchange	-0.010	-1.845	.066

APPENDIX I

Emotional/Cognitive Processing
(Measurement/Scoring Definitions)

Subj. No _____ Time Point _____ Date _____ Rater _____

A. Instructions

Step 1: Record subject number, your initials, and the date at the top of the scoring sheet.
Step 2: Read the essay through completely once, and then once more for content.
Step 3: Answer questions 1-4 thoughtfully on the scoring sheet (Remember you must identify specific evidence in the text of the essy, or supportable clinical inference, to support each of the ratings that you assign).

B. Scoring

1. To what extent did the material show realistic cognitive appraisals of the event, a reflection on the problem, a deeper understanding of the problem, reviewing the problem in a more adaptive way, or identifying causal relationships?

RATE from 1 – 7

1 = Negative/distorted appraisal **7 = Realistic/positive appraisal**

2. To what extent did the material show the person's view of him/herself? To what extent did the material show positive/negative feelings about the self?

RATE from 1 – 7

1 = Negative view of Self (explicit statements in 2+ areas or suicidal ideation)
2 = Explicit statement in 1 area
3 = Inferred, no explicit statement
4 = Neutral view of Self (no evidence of +/- or equal +&- statements
5 = Inferred, no explicit statement
6 = Explicit statement in 1 area
7 = Positive view of Self (unequivocal; explicit statements in 2+ areas)

3. To what extent did the material indicate problem solving or adaptice sort of behavior? To what extent was there evidence that the subject has adopted an approach oriented response to the stressor?

RATE from 1 – 7

1 = No evidence
2 = Aware of/specifies stressor
3 = Thinking of solutions/intention to change behavior
4 = Planning/preparation

5 = Implements 1 solution strategy
6 = Implements >1 solution strategy
7 = Evidence of efficacy/stressor less toxic

4. To what extent was the person involed in discussing the various aspects of the traumatic or stressful event?

RATE from 1 – 7

1 = Only minimally involved…4 = moderately involved…7 = Fully involved

5. Didi the participant follow directions? **YES NO**
   If NO, what did they write about? _____

6. How serious was the event discussed? **RATE from 1 – 7**

1 = Not at all serious…4 = Moderately serious…7 = Very serious

7. What was the most severe stressor/trauma written about? _____

8. Most severe stressor/trauma was written about: **Past (>6mo)/Present (<6mo)/Unk**

9. Did the most severe stressor/trauma written about occur during: **Child/Adult/Unk**

Emotion Word Count

Positive Emotion Words		**Negative Emotion Words**	
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____