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Negative Event Appraisals, Cognitive Processing, and Adjustment

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Negative Event Appraisals, Cognitive Processing, and Adjustment

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The meanings that people assign to stressful events (i.e., their appraisals) are linked to their adjustment to those stressful events (e.g., Pakenham, Chiu, Burnsall, & Cannon, 2007; Tan, Jensen, Thornby, & Anderson, 2005). Appraisals can include perceptions of an event as threatening, uncontrollable, controllable, central, or challenging (Peacock & Wong, 1990). Many studies have examined effects of these appraisals on adjustment and cognitive processing (Aldwin, 2007; Lazarus, 1993; Tan, Jensen, Thornby, & Anderson, 2005), and a few have suggested that cognitive processing mediates relationships between appraisals and adjustment (Peacock & Wong, 1996). Cognitive processing refers to attempts, either deliberate or automatic, to integrate specific experiences with pre-existing cognitive schemas (Janoff-Bulman, 1992; Williams, Davis, & Millsap, 2002).

In this study, we examine both deliberate and automatic cognitive processing. Deliberate cognitive processing is captured by two types of coping, religious coping and positive reinterpretation. Coping involves a range of activities individuals do when they encounter stressors, to deliberately deal with the stressor and resulting distress (Folkman & Lazarus, 1986). Some coping activities involve cognitive processing (e.g., positive reappraisal), but most do not. Coping processes that are considered to be deliberate cognitive processing include religious coping and positive reframing/positive reinterpretation (Park, 2010). Deliberate cognitive processing, or deliberate meaning making, refers to a broad category of efforts to deal with a situation through meaning-related strategies that can be directed toward changing either appraised or global meaning (Park, 2010).

Automatic cognitive processing, on the other hand, works to unconsciously reduce discrepancy (Greenberg, 1995; Horowitz, 1986). In this regard, brooding rumination and intrusions, thinking about the negative emotions stressful event over and over, is a recursive
process thought to reduce discrepancy and help integrate the appraised meaning of the stressor with global meaning, and is therefore considered a type of automatic cognitive processing (Park, 2010). Another subtype of rumination revealed in a factor analysis is reflection rumination (Treynor, Gonzales, & Nolen-Hoeksema, 2003). While brooding rumination is a passive comparison of one’s current situation to an unachieved standard, reflection rumination is a turning inward to engage in cognitive problem solving to alleviate depressive symptoms.

Brooding rumination is associated with negative affect (Moberly & Watkins, 2008) depression (Burwell & Shirk, 2007; Joormann, Dkane, & Gotlib, 2006; Siegle, Moore, & Thase, 2004; Treynor et al., 2003), and PTSS (Cox, Kenardy, & Hendrikz, 2008). Reflective rumination has been found to be related to depression in some studies (Fresco, Frankel, Mennin, Turk, & Heimberg, 2002; Joormann et al., 2006; Siegle et al., 2004; Treynor et al., 2003), but not others (Burwell & Shirk, 2007; Lo, Ho, & Hollon, 2008). Because reflection rumination has not to our knowledge previously been studied within the context of appraisals, we focus on brooding rumination in this manuscript.

Other types of coping that are not considered cognitive processing include active coping and seeking information or advice or comfort from social support (Carver, Scheier, & Weintraub, 1989). Conceptually, coping and cognitive processing overlap but neither subsumes the other. For example, some religious coping involves cognitive processing (e.g., reappraising events based on religious or spiritual beliefs), but not all religious coping is cognitive (e.g., seeking congregational support). And not all religious responses to an event are religious coping (e.g., ruminating that a stressful event happened because one was sinful).

In this study, we compare deliberate cognitive processing (i.e. religious coping and positive reinterpretation coping), automatic cognitive processing (i.e. rumination) and active
coping. As we discuss below, we also examined active coping as a contrast to cognitive processing. Although active coping is generally considered to be the most adaptive type of coping (e.g., Aldwin, 2007), cognitive processing may be a particularly useful (as opposed to or in addition to) active coping in the context of ongoing or chronic stressors because, in the context of an ongoing stressor, there may be limited opportunity to utilize active coping strategies to fix the chronic stressor itself (Lepore and Greenberg, 2002).

Generally, literature suggests that appraisals are an important key to adjusting to stressful events. In fact, a number of models stemming from the Cognitive Theory of Stress and Coping have focused on just that through almost fifty years of literature (Lazarus, 1966; Folkman & Lazarus, 1984; Folkman, 2007; Park, 2010). Yet much remains to be learned about appraisals and cognitive processing. Most studies that have examined appraisals and their impact on cognitive processing and adjustment used methods that limited their informativeness (e.g., Tan, Jensen, Thornby, & Anderson, 2005). Specifically, only a few studies have attempted to examine meditational relationships between variables, previous studies have been predominantly cross-sectional, and few studies have examined both deliberate and automatic cognitive processing along with other potentially adaptive responses to stressors such as active coping. The current study was designed to more comprehensively test the direct and indirect relationships among appraisals, cognitive processing, and adjustment which have been suggested but inadequately tested in previous studies. We used a research design that improved upon previous studies’ methodological limitations.
Appraisals and Adjustment

The link between appraisals of stressful events and adjustment to these events has been supported by much empirical literature. Negative appraisals have been linked with adjustment outcomes such as posttraumatic stress symptoms (e.g., Dunmore, Clark, & Ehlers, 2001; Ehlers, Mayou, & Bryant, 2003; Fairbrother & Rachman, 2006; Mayou, Ehlers, & Bryant, 2002), and depression (Gerard, Buehler, Franck, & Anderson, 2005; Linn, Linn, & Harris, 1982; Steinhardt & Smith, 2001). For example, appraisals of controllability, or the degree to which one perceives control over the course and outcome of a stressor, have been negatively correlated with maladaptive adjustment, including posttraumatic stress symptoms and depression in samples of cancer survivors (Linn, Linn, & Harris, 1982; Llewellyn, Mcgurk, & Weinman, 2007; Steinhardt & Smith, 2001) and in a sample experiencing infertility (Stanton, Tennen, Affleck, & Mendola, 1991).

Additionally, appraisals of uncontrollability, or perception that one does not have control or has little control over the stressful event, has been linked to increased distress. For example, in a sample of mothers of NICU infants (e.g., Reichman et al., 2000), appraisals of uncontrollability were related to increased distress. Wong and Reker (1983) demonstrated that events appraised as controllable-by-self, controllable-by-others, and uncontrollable-by-anyone are associated with different patterns of coping, suggesting that controllability-by-self is empirically distinct from uncontrollability (Wong & Reker, 1983, Peacock & Wong, 1990).

Appraisals of centrality, or how meaningful, important, or salient the event is to the individual, have been shown to create increases in both posttraumatic stress symptoms and depression. For example, in a sample of currently depressed, recovered depressed, and never depressed individuals, appraisals of centrality were related to increases in intrusions and intrusive thoughts.
across all three groups (Newby & Moulds, 2011). Threat appraisals, or the perception of an event as one that has the potential for harm or loss in the future, has been linked with increased depression. For example, in a sample of individuals with diabetes, the greater their appraisal of their illness as threatening and harmful, the greater their depressive symptoms (Connell, Davis, Gallant, & Sharpe, 1994). Similarly, the more a group of children appraised their parents’ divorce as threatening or having the potential to cause harm to themselves in the future, the higher their depressive symptoms (Lengua & Long, 2002). Finally, appraisals of challenge, which reflect the anticipation of gain or growth from the stressful experience, have been linked to distress. For example, in a sample of college students asked to perform difficult tasks on a computer, appraisals of challenge were linked to negative affect (Besser, Flett, & Hewitt, 2004).

**Appraisals and Cognitive Processing/Coping**

A body of evidence is accumulating regarding the relationship between event appraisals and subsequent cognitive processing.

Many studies have compared internal cognitive processing with outward active coping (e.g., Christie, Meyerowitz, Giedzinska-Simons, Gross, & Agus, 2008), but none in the context of appraisals. Tedeschi and Calhoun (1995) noted that early coping efforts are often emotion-focused cognitive processing in large part to manage and make tolerable the aversive affect associated with the event. For example, aspects of denial or disbelief may alternate with intrusive ruminations about the event (see also Horowitz, 1986) as a means to gradually assimilate the fact and implications of the event. Butler et al. (2005) argued that active coping tends to be associated with better long term adjustment than are strategies that involve avoidance or disengagement (Carver, Scheier, & Weintraub, 1989; Holahan & Moos, 1985), especially in terms of trauma.
However, others have found both cognitive processing and active coping equally helpful. One study measured both active coping and positive reframing coping in a sample of early stage breast cancer patients, finding that both types of processing were related to less post-traumatic stress symptoms (PTSS) (Culver, Arena, Antoni, & Carver, 2002). Cognitive processing may be a particularly salient comparator to active coping in terms of ongoing or chronic stressors. Some researchers have suggested that cognitive processing lends is effective for adjustment that is ongoing (Lepore & Greenberg, 2002).

Rumination is a type of cognitive processing that involves thinking about a stressor or feeling over and over (Smith & Alloy, 2009). It can be conceptualized as comprising both adaptive (reflection) rumination and maladaptive (brooding) rumination (Clohessy & Ehlers, 1999, see Smith & Alloy, 2009 for a review). Appraisals of controllability have been linked to a decrease in brooding rumination, while appraisals of uncontrollability have been linked to an increase in brooding rumination (Nolen-Hoeksema & Jackson, 2001). No studies to our knowledge have examined the relationship between appraisals and reflection rumination.

Appraisals of controllability, along with appraisals of threat, have been linked with posttraumatic stress (Field, Norman, & Barton, 2008; Linley & Joseph, 2004). For example, in a sample of stroke patients, cognitive appraisals of controllability explained a significant amount of variance in the severity of PTSD symptoms shortly following at the stroke (Field, Norman, & Barton, 2008). Also, appraisals of uncontrollability have been linked to increases in religious coping; for example, this was found in a population of undergraduate students in search of employment (Peacock, Wong, & Reker, 1993).
Additionally, in a study of college students reporting on their most stressful event in the past six months, appraising a stressor as a challenge (e.g., Park & Fenster, 2004) has been linked with more deliberate cognitive processing (positive reframing coping). Deliberate cognitive processing has also been shown to be correlated with appraisals of controllability (e.g., Folkman, Lazarus, Dunkel-Schetter, DeLongis, & Gruen, 1986). In a sample of 85 married couples, appraisals of self control were significantly related to positive reappraisal (Dunkel-Schetter, DeLongis, & Gruen, 1986).

**Cognitive Processing and Adjustment**

Cognitive processing, here defined as rumination, positive reframing, and religious coping, has been studied extensively in the context of adjustment to stressful events (Gangstad, Norman, & Barton, 2009; Lazarus, 1991). Depressive rumination or brooding rumination has been widely studied, and its deleterious effects on negative thinking, problem solving and instrumental behavior, social support, posttraumatic stress symptoms, and depressive symptoms have been well-documented. In a review of rumination, its relationships with negative automatic thoughts, self-consciousness, self-focus, repetitive thoughts, intrusive thoughts, was the most prevalent posttraumatic stress symptom and the key feature of PTSD, obsessions, worry, emotion regulation and coping, neuroticism, and social and emotional competence were presented (see Smith & Alloy, 2009, for a review). It is a characterizing feature of and crucial component of depression (Smith & Alloy, 2009). Again, although the construct of reflection rumination has been introduced, literature linking it to adjustment is more sparse, and those findings that do have been inconsistent (Surrence, Miranda, Marroquin, & Chan, 2009). For example, one study has found that reflection rumination has been linked inversely with depression (Treynor et al.,
2003), a few have found it linked positively with depression (Fresco, Frankel, Mennin, Turk, & Heimberg, 2002; Joormann et al., 2006; Siegle et al., 2004; Treynor et al., 2003), and a few have found no correlation (Burwell & Shirk, 2007; Lo, Ho, & Hollon, 2008).

Positive reframing coping (also known as positive reinterpretation coping; Carver, 1986) has been linked to various positive adjustment outcomes, including decreased distress in a study of early stage breast cancer patients (Culver, Arena, Antoni & Carver, 2002) and posttraumatic stress in a caregiver population (Loiselle et al., 2011). A reported decrease in PTSS and increase in posttraumatic growth was reported following the use of positive reframing coping. Garnefski, Kraaij, Schroevers, and Somsen (2008) reported similar results of decreased PTSS with the use of positive reframing coping after a myocardial infarction.

Religious coping has been associated with a variety of adjustment outcomes, including lower rates of depression (Koenig et al., 1992), better mental health status (Pargament et al., 1994), better physical health (Powell et al., 1995; McIntosh & Spilka, 1990; Pressman, Lyons, Larson, & Strain, 1990), and stress-related growth (Park & Cohen, 1993). These effects have been shown to remain after controlling for the effects of socio-demographic variables, global religious measures, and nonreligious coping measures (e.g., Koenig et al., 1995; Pargament, 1997).

Coping and Cognitive Processing as Mediating the Appraisal-Adjustment Link

Some researchers have presented theories regarding the mediating effect of cognitive processing on the relationships between cognitive appraisal and adjustment outcomes. For example, Ehlers and Clark (2000) proposed that negative appraisals are likely to lead to various cognitive processing strategies that are intended to control the sense of current threat and PTSD.
symptoms. Lepore and Greenberg (2002) suggested that adopting a cognitive processing perspective leads to a focus on recent events for which adjustment is ongoing. These researchers posit that if one can intervene early in the cycle and help individuals to cognitively process events as they are unfolding, this should prevent further emotional or physiological damage later on. Cognitive processing can help to prevent a potential negative cycle in which intrusions both provoked and are triggered by chronic physiological arousal and emotional distress (McFarlane, 1992, as cited in Lepore & Greenberg, 2002). Culver et al. (2002) emphasized that the way one processes and copes with stressful events, such as a diagnosis of breast cancer, leads to long term adjustment because cognitive processing allows one to come to terms with the stressful event or diagnosis. A few basic models have been proposed to explain relations between stress appraisal, coping, and adjustment, and these have been widely studied with coping variables. The main effects model proposes that stress appraisal, coping resources, and coping strategies have direct, independent effects on adjustment (Aldwin & Revenson, 1987; Cohen & Wills, 1985).

Many empirical studies have examined appraisals, cognitive processing and adjustment in a single study (e.g. Folkman, Lazarus, Dunkel-Schetter, DeLongis, & Gruen, 1986; Reichman et al., 2000; Tan, Jensen, Thornby, & Anderson, 2005), but very few have tested for the mediating effects of cognitive processing on the link between appraisals on adjustment. For example, Folkman et al. (1986) examined the relationships between appraisals and adjustment, appraisals and cognitive processing, and cognitive processing and adjustment, but not the mediation of cognitive processing in the relationship between appraisal and adjustment. Stanton and Snider (1993) attempted to test coping and cognitive processing strategies as mediators of the relationship between appraisal variables and mood in a cancer population. However, only coping and cognitive processing variables significantly predicted postbiopsy and postsurgery
mood, so these analyses could not be conducted.

Moderational but not meditational relationships were tested in a pre- post- study of mothers being discharged from the NICU (Affleck & Tennen, 1991). Subjects reported more distress after discharge when they had expected greater control over their child's development and had used instrumental action coping more often and less distress when they had sought meaning more often. Coping literature has more often examined coping as a moderator, whether the presence or absence of this construct creates the relationship with the dependent outcome variable, rather than as a mediator, with the independent and dependent variable relationship is not dependent on the coping mediator, but the coping mediator explains some of the relationship between these two variables as a construct in this causal model. There is an opportunity for examination of coping as a mediator rather than a moderator.

Pakenham and Rinaldis (2001) noted the small number of studies that have examined appraisals, various coping and cognitive processing strategies, coping resources, adjustment outcomes, and the relationships these variables have in a single study, and set out to investigate the direct and buffering effects of appraisals and coping on various domains of adjustment, specifically with an HIV/AIDS population. However, they did not test coping or cognitive processing as mediators of the relationship between stress appraisal and adjustment.

A study of undergraduates by Peacock and Wong (1996) found that religious coping mediated the relationship between appraisals of uncontrollability and negative affect. However, negative affect was poorly operationally defined (i.e., items from an optimism and a locus of control scale that appeared to tap into negative affect).

One meta-analysis of six studies of the mediating role of active coping on appraisals and their relations with adjustment in youth (Clarke, 2006) found that appraisals lead to active
coping, which leads to adjustment in youth, but this meta-analysis did not include cognitive processing.

As noted above, several models have been proposed to explain relations between stress appraisal, coping, and adjustment, and these have been widely studied with coping variables. However, this work has not been extended to specifically include cognitive processing, and therefore generally leaves out the non-deliberate (ruminative) aspects of cognitive processing.

This study aims to extend models of direct effects and mediated effects to cognitive processing and to examine both the direct effects of appraisal and cognitive processing on adjustment outcomes and the indirect (mediated) effects of cognitive processing in the relationship between appraisal and adjustment.

3. Limitations of Current Research and Design of Current Study

This study aims to extend previous research and to improve upon previous limitations in design and scope. It will utilize a methodological design that is scientifically rigorous and conduct a comprehensive assessment of appraisals, coping and cognitive processing, and outcomes in mediation models, in which one can examine indirect and direct effects.

Most previous studies that have examined stress appraisals, cognitive processing, and adjustment have been cross-sectional in design (e.g., Folkman et al., 1986; Tan, Jensen, Thornby, & Anderson, 2005); very few have examined meditational relationships between appraisals, reactions, and adjustment (Peacock & Wong, 1990; Stanton & Snider, 1993). Folkman and Lazarus (1986) called for studies of appraisals, processing, and adjustment outcomes that are not cross-sectional, in order to better understand causality. Sampling at multiple time points is important as well, because more data collection points lead to more accurate data, since
A retrospective report tends to be biased (Cole & Maxwell, 2003). Three time points is also the desired number of time points for testing mediation (Cole & Maxwell, 2003; McArdle et al., 1991; Rogosa et al., 1982; Shrout & Bolger, 2002). Longitudinal design enables researchers to make tentative inferences about causal relations implied by such models (Cole & Maxwell, 2003). Peacock and Wong (2000) specifically called for a prospective longitudinal study to understand how appraisals mediate cognitive processing and adaptational outcomes.

We endeavored to improve on previous research by utilizing empirically supported methods for mediation analysis, including use of Structural Equation Modeling (SEM), which is considered the gold standard to examine mediation (Kline, 2004, 2010; Ullman & Bentler, 2003). Longitudinal designs must additionally control for initial distress in any models of direct and indirect effects on adjustment due to the stability of distress variables over time (Rice, Richardson, 2012). This study therefore accounts for initial distress in each proposed SEM model. In order to collect data at three time points, we prompted participants to report on a single stressful event that was current and ongoing.

Additionally, this study prompted for an event stressful enough to elicit cognitive processing strategies. Previous research has shown that many acute stressors reported by college students are not stressful enough to evoke cognitive processing or coping efforts (LoSavio et al., 2011). One method that has been used to assess whether a person has experienced an amount of distress necessary to elicit cognitive processing and coping strategies is to assess degree of core belief disruption. Core belief disruption refers to the degree to which a stressor challenges an individual’s views of the world. Stressful events that disrupt the assumptive world are presumed to force people to make changes (i.e., cope, cognitively process) in response to these highly stressful experiences (Cann et al., 2010).
A number of studies have examined both deliberate and automatic cognitive processing along with other potentially adaptive responses to stressors such as active coping (e.g., Peacock & Wong, 1996). We included active coping, a problem focused approach, in the current study as a comparison to cognitive processing. Many studies have compared inward cognitive processing strategies with outward active coping (e.g., Christie, Meyerowitz Giedzinska-Simons, Gross, & Agus, 2008, Tomaka, Blascovitch, Kelsey, & Leitten, 1993), but none in the context of appraisals and adjustment. However, active coping on its own has been studied extensively, and is related to appraisals (Lazarus & Folkman, 1984) and adaptive adjustment outcomes (Aspinwall & Taylor, 1992; Brown & Nicassio, 1987). Active coping has also been shown to be a mediator between appraisal and adjustment (Lazarus & Folkman, 1984). For example, in a meta-analysis of samples of teenagers, active coping was related to adaptive psychosocial outcomes, including decreased depression. Many fewer studies have focused on cognitive processing and adjustment. However, cognitive processing may be a particularly salient comparator to active coping in the context of ongoing or chronic stressors.

This study was designed to expand on previous literature by comparing models of cognitive processing suggested by prior studies and to improve upon shortcomings of this work. Specifically, this study examines direct and indirect relationships among appraisals, cognitive processing/active coping and adjustment at three time points using Structural Equation Modeling. Our study prompted for events that would elicit prolonged coping and distress, controlled for initial distress in all tested models, and compared cognitive processing models to active coping models within the context of participants’ ongoing stressors.

In order to narrow the scope of the models, and to build upon previous literature, we examined direct and indirect effects of associations between appraisals and cognitive processing,
appraisals and adjustment, and cognitive processing and adjustment that have been shown in previous literature. For example, if a specific type of appraisal was shown to be linked with a type of cognitive processing or active coping, and this type of processing has been shown to be related to adjustment, these three variables were combined into a mediation model to be tested.

Adjustment outcomes in models include depression and posttraumatic stress symptoms. These two adjustment variables were selected for study because appraisals and cognitive processing are differentially related to these two adjustment outcomes, and they are particularly salient because they tend to be the most prevalent outcomes measured in cognitive processing and active coping literature (Blanchard et al., 2005; Billings & Moos, 1984; Rusting, 1998). Depression is the most common mental health issue in college students (Kazdin, 2000). In 2009, the American College Health Association-National College Health Assessment (ACHA-NCHA)—a nationwide survey of college students at 2- and 4-year institutions—found that nearly 30 percent of college students reported feeling "so depressed that it was difficult to function" at some time in the past year (Eisenberg, Gollust, Golberstein, & Hefner, 2007). PTSS are widely reported as well; in one study, 84% of college students reported experiencing at least one event of sufficient intensity potentially to elicit PTSD (Vrana & Lauterbach, 2006).

Specifically, we hypothesized that:

1. The appraised characteristics of events will determine the types of cognitive processing in which people engage following a stressor.
2. The type of cognitive processing used will affect adjustment outcomes
3. Mediation models will show that link between characteristics and adjustment are mediated by cognitive processing.

4. Some types of cognitive processing (specifically reappraisal and religious coping) will be as helpful as or more helpful than active coping in mediating between appraisals and adjustment for ongoing stressors.

Below are the proposed models to examine direct and indirect effects of relationships suggested by previous research, but never studied, to date, in a full meditational model with three time points, with SEM, and controlling for initial distress. Models are grouped by appraisal type. Each model is tested if that given appraisal is related to brooding rumination, religious coping, positive reappraisal or active coping, and if that appraisal and mediator are related to the same outcome (either depressive symptoms or PTSS).
This model was based on previous work demonstrating that appraisals of control were inversely related to PTSS (e.g., Louiselle et al., 2011; Tsay, Halstead & McCrone, 2000), appraisals of control were related to religious coping (e.g., Bickel et al., 1998; Pargament, Smith, Koenig & Perez, 1998), and religious coping was inversely related to PTSS (e.g., Langharne et al., 2007).
Model #2

This model was based on previous work demonstrating that appraisals of control were inversely related to depressive symptoms (depressive sx; e.g., Aiken & Baucom, 1982; Benassi, Sweeney, & Dufour, 1988; Llewellyn, Mcgurk, & Weinman, 2007), appraisals of control were inversely related to religious coping (e.g., Spilka, Shaver, and Kirpatrick (1985) and religious coping was related to depressive symptoms (e.g., Koenig et al., 1992).
This model was based on previous work demonstrating that appraisals of control were inversely related to depressive symptoms (e.g., Llewellyn, Mcgurk, & Weinman, 2007), appraisals of control were inversely related to brooding rumination (e.g., Papageorgiou, 2001) and brooding rumination was related to depressive symptoms (e.g., Cribbs, Moulds, & Carter, 2006; Nolen-Hoeksema & Harrell, 2002).
Model #4

This model was based on previous work demonstrating that appraisals of control were inversely related to depressive symptoms (e.g., Aiken & Baucom, 1982; Benassi, Sweeney, & Dufour, 1988; Llewellyn, et al., 2007), appraisals of control were related to positive reinterpretation coping (e.g., Hilton, 1989) and positive reinterpretation coping was inversely related to depressive symptoms (e.g., Carver et al., 1993).
This model was based on previous work demonstrating that appraisals of control were inversely related to PTSS (e.g., Louiselle et al., 2011; Tsay, Halstead & McCrone, 2000), appraisals of control were related to positive reinterpretation coping (e.g., Hilton, 1989), and positive reinterpretation coping was related to PTSS (e.g., Linley & Joseph, 2004).
This model was based on previous work demonstrating that appraisals of control were inversely related to PTSS (e.g., Louiselle et al., 2011; Tsay, Halstead & McCrone, 2000), appraisals of control were related to active coping (e.g., Clarke, 2006), and active coping was inversely related to PTSS (e.g., Louiselle et al., 2011).
This model was based on previous work demonstrating that appraisals of control were inversely related to depressive symptoms (e.g., Aiken & Baucom, 1982; Benassi, Sweeney, & Dufour, 1988; Llewellyn et al., 2007), appraisals of control were inversely related to active coping (e.g., Clarke, 2006), and active coping was related to depressive symptoms (e.g., Billings & Moos, 1984; Kennedy, Duff, Evans & Beedie, 2003).
Appraisals of Uncontrollability Models

Model #8

This model was based on previous work demonstrating that appraisals of uncontrollability were related to depressive symptoms (e.g. Heker & Sedek, 1999), appraisals of uncontrollability were related to brooding rumination (e.g. Papageorgiou, 2001), and brooding rumination was related to depressive symptoms (e.g. Cribbs, Moulds, & Carter, 2006; Nolen-Hoeksema & Harrell, 2002).
This model was based on previous work demonstrating that appraisals of uncontrollability were related to PTSS (e.g. Cox, Kenardy, & Hendrikz, 2008), appraisals of uncontrollability were related to brooding rumination (e.g. Papageorgiou, 2001), and brooding rumination was related to PTSS (e.g. Mieser-Stedman, Yule, Dalgleish, Smith, & Glucksman, 2006).
This model was based on previous work demonstrating that appraisals of uncontrollability were related to depressive symptoms (e.g., Heker & Sedek, 1999), appraisals of uncontrollability were related to religious coping (e.g., Clarke, 2006), and religious coping was inversely related to depressive symptoms (e.g., Koenig et al., 1995).
Appraisals of Centrality Models

Model #11

This model was based on previous work demonstrating that appraisals of centrality were related to depressive symptoms (e.g., Roesch & Rowley, 2005), appraisals of centrality were related to brooding rumination (e.g., Clarke, 2006) and brooding rumination was related to depressive symptoms (e.g., Cribbs, Moulds, & Carter, 2006; Nolen-Hoeksema & Harrell, 2002).
Model #12

This model was based on previous work demonstrating that appraisals of centrality were related to depressive symptoms (e.g., Roesch & Rowley, 2005), appraisals of centrality were related to religious coping (e.g., Booth, 2009) and religious coping was inversely related to depressive symptoms (e.g., Bosworth et al., 2003; Koenig et al., 1992).
Appraisals of Threat Models

Model #13

This model was based on previous work demonstrating that appraisals of threat were related to PTSS (e.g., Kachirski, 2003; McIntosh, Harlow & Martin, 1995), appraisals of threat were related to active coping (e.g., Clarke, 2006; Gallant, & Sharpe, 1994) and active coping was inversely related to PTSS (e.g., Louiselle et al, 2011).
Model #14

This model was based on previous work demonstrating that appraisals of threat were related to depressive symptoms (e.g., Radecki-Bush, Farrell, & Bush, 1993), appraisals of threat were inversely related to active coping (e.g., Clarke, 2006; Gallant, & Sharpe, 1994) and active coping was inversely related to depressive symptoms (e.g., Brown & Nicassio, 1987).
This model was based on previous work demonstrating that appraisals of threat were related to PTSS (e.g., Kachirski, 2003; McIntosh, Harlow & Martin, 1995), appraisals of threat were related to religious coping (e.g., Park & Fenster, 2004) and religious coping was related to PTSS (e.g., Langharne et al., 2007).
Model #16

This model was based on previous work demonstrating that appraisals of threat were related to depressive symptoms (e.g., Radecki-Bush, Farrell, & Bush, 1993), appraisals of threat were related to religious coping (e.g., Park & Fenster, 2004) and religious coping was inversely related to depressive symptoms (e.g., Bosworth et al., 2003; Koenig et al., 1992).
Appraisals of Challenge Models

Model #17

This model was based on previous work demonstrating that appraisals of challenge were related to depressive symptoms (e.g., Tsay, Halstead & McCrone, 2000), appraisals of challenge were related to active coping (e.g., Clarke, 2006) and active coping was related to depressive symptoms (e.g., Brown & Nicassio, 1987).
This model was based on previous work demonstrating that appraisals of challenge were related to depressive symptoms (e.g., Tsay, Halstead & McCrone, 2000), appraisals of challenge were related to positive reinterpretation coping (e.g., Rowley et al., 2005) and positive reinterpretation coping was inversely related to depressive symptoms (e.g., Carver et al., 1993).
Method

Participants

Two hundred-eighty-four participants (mean age=19.2; 76.8% female; 72.1% Caucasian, 14.2% Asian, 5.0% Black/African American, 4.6% Latino, 4.1% “Other”) were recruited via the Psychology Department participant pool website at the University of Connecticut. Participants were compensated with credit for an introductory psychology course. Ninety-three participants did not report on the same ongoing event at all three time points. Because their data could not be used in the analyses regarding appraisal, cognitive processing, and adjustment outcomes at all three time points, these data were removed from the study, leaving 191 participants. Participants were informed that any information they provided was confidential. They were also told that they could quit the study at any point.

Procedure

Participants completed a battery of questionnaires at three time points, each about a month apart, between September 2011 and December 2011. We asked participants to report reactions to the same event at all three time points (i.e., “What is the worst ongoing thing you are currently dealing with?”). At each time point, participants reported appraisals and reactions to the event, as well as cognitive processing techniques and adjustment.

The battery of questionnaires assessed the amount of core belief disruption caused by the event. We also assessed appraised event characteristics. Event appraisals included: controllable, threat, centrality, uncontrollable, and challenge. At each time point, we also assessed cognitive processing, including rumination and religious coping, and outcomes, including posttraumatic stress symptoms and depressive symptoms. We used three time points because three
measurements is the minimum for any examination of mediation (McArdale, 1991; Rogosa et al., 1982). We conducted the analyses with Structural Equation Modeling (SEM).

In the study description, participants were informed that they would be sent a link to an online survey via email that would ask them to answer multiple questions (parts 1 through 3). They were directed to a website online where they were asked to set aside approximately 30 (part 1) or 20 minutes (remaining parts 2 and 3) of uninterrupted time to answer all the questions. If they were unable to complete the study at the time they opened the survey, they were able to save their responses and complete the survey at a later time. They were informed when they signed up that Parts 2 and 3 of the study were about a month after Part 1 and 2, respectively; at those times they received email links to follow-up online surveys. Participants received research credit for their participation at each time point.

**Measures**

Below is a list of psychological constructs in the study and the subsequent battery of questionnaires we used to measure them.

**Demographics**

*Gender, Race & Ethnicity* We asked the participants to identify their gender, race, and ethnicity with a series of five questions.

**Event appraisals:**

*Stressor* Participants were asked to answer the question: “What is the most stressful ongoing thing you are currently dealing with?” in an open-ended field. The study then asked them to keep this event in mind for the duration of the survey (e.g., “Please answer the following questions according to how you feel about the most stressful thing you are currently dealing
They were instructed to recall their previously reported event at time points 2 and 3. Participants reported on the same stressful thing at each time point.

**Stress appraisals** The Stress Appraisal Measure (SAM; Peacock & Wong, 1990) is a 24-item scale (4 per each subscale of Controllable by self, Controllable by others, Threat, Centrality, Uncontrollable, and Challenge). Because of multicollinearity (correlation higher than .90) between the controllable-by-self subscale and the controllable-by-other subscale at r = .91, we excluded the controllable-by-other subscale from these analyses. The SAM measures how individuals interpret stressful events. Higher scores indicate a higher degree of endorsement of appraisal of each domain. In this case, Cronbach’s alpha (α) was .89 for the controllability subscale, .75 for the threat subscale, .89 for the centrality subscale, .86 for the uncontrollability subscale, and .84 for the challenge subscale at Time 1. Alphas were similar at Time 2 (controllability α = .93, threat α = .63, centrality α = .91, uncontrollability α = .89, challenge α = .89) and Time 3 (controllability α = .916, threat α = .76, centrality α = .89, uncontrollability α = .88, challenge α = .87).

**Core belief disruption** The Core Beliefs Inventory (CBI; Cann et al., 2010) is 12-item measure of disruption to one’s assumptive world. Stressful events that disrupt the assumptive world are believed to force people to make changes to accommodate these stressful experiences (Cann et al., 2010). A higher score indicates more core belief disruption. Cronbach’s alpha demonstrated good reliability for this study (Time 1 α = .83, Time 2 α = .81, Time 3 α = .74).

**Processing**

**Coping** The COPE (Carver, Scheier, & Weintraub, 1989) assesses a broad range of coping responses and has been used in hundreds of studies to understand how individuals deal with stressful events and consists of 15 4-item subscales assessing 15 different types of coping.
Higher scores indicate greater amounts of coping in each subscale domain. Reliability (Time 2 religious coping $\alpha=.94$, positive reinterpretation $\alpha=.80$ active coping $\alpha=.69$) and validity of the scale has been shown to be acceptable to good (e.g., Carver, Scheier, & Weintraub, 1989; Carver & Scheier, 1994). We used three subscales of four items each (religious coping, positive reinterpretation, active coping), or 12 items total, from this measure.

Rumination The Response Styles Questionnaire, Ruminative Responses Subscale (Brooding subtype; RSQ, RRS; Nolen-Hoeksema & Morrow, 1991) is a 22-item measure that has been extensively used and has been shown to have good internal consistency moderate to high test-retest reliability over one year ($r = 0.47$, $p < .001$) and validity for predicting depression (Just & Alloy, 1997; Kuehner & Weber, 1999; Nolan, Roberts, & Gotlib, 1998; Nolen-Hoeksema et al., 1994; Nolen-Hoeksema, 2000; Spasojevic & Alloy, 2001). In the present study, Time 1 $\alpha = .91$, Time 2 $\alpha = .96$, Time 3 $\alpha = .97$.

Adjustment

PTSS The PTSD Checklist – Civilian (PCL-C; Blanchard, Jones-Alexander, Buckley, & Forneris, 1996) is a widely-used self-report measure that corresponds with diagnostic criteria for PTSD. A validation study with a college student sample demonstrated good test-retest reliability ($r = .87$) and good internal consistency reliability. (Adkins et al., 2008). In the present study, Time 1 $\alpha = .94$, Time 2 $\alpha = .95$, and Time 3 $\alpha = .97$.

Depressive symptoms The Depression, Anxiety, and Stress Scale (DASS 21; Lovibond & Lovibond, 1993) assesses 3 aspects of distress, each with a 7 item subscale (depression, anxiety and stress). Psychometric properties have been demonstrated for these widely used scales (Norton, 2007). In the current analyses, we focused only on the depression subscale, which had
good internal reliability (Time 1 $\alpha = .74$, Time 2 $\alpha = .82$, Time 3 $\alpha = .78$). Higher scores indicate a higher degree of depressive symptoms.

*Data Analytic Plan*

Step 1. In order to establish a data analytic strategy that did not capitalize on the sheer number of variables in this study, we set up structural equation models by appraisal type, using only the links suggested by previous research. So, for each appraisal type, we created models including the cognitive processing, active coping, and adjustment outcomes with which they had been linked in previous literature. We linked the Time 1 appraisal to Time 2 processing or active coping to Time 3 adjustment outcomes, as we hypothesized indirect effects. We also controlled for initial distress, as is recommended for SEM analyses (e.g. Littleton, Axsom, & Grills-Taquechel, 2012).

Step 2. In order to reduce the number of models even further and in compliance with standards for Structural Equation Modeling (SEM), we used bivariate correlations for all relationships in the models set up in Step 1. These bivariate correlations between appraisals and cognitive processing, appraisals and adjustment, and cognitive processing and adjustment, allowed us to eliminate paths in the structural equation model that were not significant in this study. After this step, only those original models whose pathways were all demonstrated to have significant correlations through bivariate correlations will be tested using SEM.

Step 3. We tested only these remaining models using SEM in AMOS. Testing only relationships demonstrating statistically significant bivariate relationships has been widely used for both hierarchical regression and SEM models (Kline, 2004, 2010; Ullman & Bentler, 2003). Models will be tested using SEM and evaluated for fit with the Chi Square ($\chi^2$) statistic, as well as other fit indices.
Step 4. We removed nonsignificant pathways from the models and test for model fit, examining fit statistics such as Chi Square, RMSEA, CFI, SRMR, etc. (Kline, 2010).

Step 5. We will test for mediation and indirect effects. Indirect effects measure the degree to which the dependent variable changes if the independent variable is held constant and the mediator is raised by one unit. Kenny (2000) defines the indirect effect as the degree of mediation in the model, but some more modern theorists conceptualize indirect effects as a construct that is separate and distinct from mediation. Namely, some argue that demonstrating partial mediation (not just the indirect effect) is important for determining mediation, because the independent variable and dependent variable must have a relationship for the mediator to effect. In addition, the reduction in variance explained by the independent variable must be significant (Sobel, 1982). We will test this using a Sobel test.

Bivariate Correlations

In order to explore the relationships between Time 1 appraisals and Time 2 cognitive processing, as well as Time 2 cognitive processing and Time 3 adjustment, we examined bivariate correlations. We also examined the differential relationships appraisals and cognitive processing with depressive symptoms versus PTSS.

Additionally, these bivariate relationships were used to establish which relationships between Time 1 appraisals, Time 2 cognitive processing, and Time 3 well-being outcomes could be tested using Structural Equation Modeling (Byrne, 2001). All paths between two variables in the hypothesized models that do not demonstrate a relationship after bivariate analyses have been eliminated from the models, creating a final set of models for testing using SEM.

Structural Equation Modeling
To examine meditation models to determine the relationships between appraisals and cognitive processing techniques and adjustment, we used Structural Equation Modeling (SEM) using AMOS software. SEM is similar to multiple regression, but involves the modeling of mediators as both causes and effects, modeling of interactions, nonlinearities, correlated independents, measurement error, and correlated error terms. SEM may be used as a more powerful alternative to multiple regression, path analysis, factor analysis, and analysis of covariance. SEM can also better assess model fit. Because this study contains three time points, SEM can be utilized as the main data analytic technique. Using a confirmatory approach, we tested the five models below.

Again, we included the Time 1 level of each Time 3 adjustment variable as a covariate in each model in order to control for initial adjustment, and stability in these variables.

*Power Section*

Appropriate steps were taken to properly handle missing data. There were 32 instances of missing data. According to missing value analysis in SPSS, these values appeared to be missing at random. This missing data was filled using automatic multiple imputation in order to analyze the Structural Equation Models using AMOS software.

SEM in AMOS was used to test the mediational path models. Using a 20-participants-per-predictor heuristic for stability of estimates of regression coefficients, ten possible predictors (e.g. Controllable-by-self, Threat, Centrality, Uncontrollability, Challenge, Positive Reappraisal, Religious Coping, Brooding Rumination, Active Coping, Depression, PTSS), would require 200 participants. Additionally, a samples size of 200 is considered adequate and seen as a goal for SEM models (Kline, 2004).
Due to participants who did not correctly complete the survey regarding the same stressful event at all three time points, our sample fell seven participants short of this 200 person goal, at 191 participants. However, this small shortfall is still acceptable according to Bentler and Chou (1987), who estimated that 5 people for every one free parameter in a model is needed. Because there are fourteen free parameters, according to their estimation, a sample of seventy would be sufficient for these analyses.

Results

Types of stressors reported and Core Belief Disruption

Participants were asked to choose the most stressful ongoing thing with which they were currently dealing at all three time points of the study. Sixty one percent (61.3%) of participants reported academic stressors, 20.9% interpersonal stressors, 11.5% time management stressors, 3.1% sports stressors, 1.0% illness stressors, 0.5% job stressors, and 1.6% “other” (See Table 1 for examples).

While previous research has shown that many stressors reported by college students may not be stressful enough to evoke cognitive processing or coping efforts (LoSavio et al., 2011), participants in this study reported a fairly high degree of core belief disruption (2.83 out of a possible 5), indicating stressful events that would be expected to initiate cognitive processing.

Bivariate Correlations

In preparation for testing the hypothesized models, we analyzed bivariate relationships between Time 1 appraisals with Time 2 cognitive processing (see Table 2), Time 1 appraisals with Time 3 adjustment (see Table 3), and Time 2 cognitive processing with Time 3 adjustment (see Table 4).
Time 1 appraisals were associated with a number of Time 2 cognitive processing strategies, as well as active coping, which is consistent with previous research. For example, appraisals of controllability by self and appraisals of uncontrollability were significantly related to almost every type of coping and cognitive processing measured. Conversely, appraisals of centrality were not significantly related to any type of potential mediator measured.

Time 1 appraisals were also associated with both adjustment outcomes. Depressive symptoms and PTSS were significantly correlated with all types of appraisals except for appraisals of centrality and appraisals of challenge.

We continued to examine possible differential relationships of appraisals and cognitive processing/coping with depressive symptoms vs. PTSS (See Table 5). Depressive symptoms and PTSS were highly correlated ($r = .78, p < .01$), yet were not correlated enough to suggest multicollinearity ($r > .90$).

Additionally, many Time 2 cognitive processing strategies were correlated with a number of adjustment outcomes. Notably, PTSS and depressive symptoms were similarly correlated with adjustment outcomes. Namely, they were both significantly related to active coping and brooding rumination, but not to positive reinterpretation or religious coping.

**SEM Models**

*Models after Bivariate Analyses*

We reduced the proposed models for SEM analysis to only those relationships that were supported by the bivariate correlations above.

A number of indices were used to assess model fit as suggested by guidelines for SEM. A non-significant $\chi^2$ indicates no significant differences between the model-implied and the data covariance matrices. In addition to the significance test, current general recommendations
suggest multiple indices of fit, such as chi squared, RMSEA (<0.05), CFI (>0.90), and SRMR (<.08) to indicate the appropriateness of a model (Bentler, 2007; Hayduk at al., 2007).

To examine overall model fit, chi squared, the squared error of approximation (RMSEA), the comparative fit index (CFI), and the standardized root mean square residual (SRMR) were used. Satisfactory model fit is indicated by RMSEA values less than or equal to .10 (Chen et al., 2008), by CFI values greater than or equal to .90 (Rigdon, 1996), and by SRMR values less than .08 (Hu & Bentler, 1999). Though, it is difficult to interpret RMSEA for low degrees of freedom models (i.e. 1-3 df; Kenny, Kaniskan & McCoach, 2011).

Five models remained to be tested for Step 3 of data analysis. They were as follows:
Model D

- T1 Depressive sx
- Time 1 Appraisal of Uncontrollable
- T2 Rumination (Brooding)
- T3 Depressive sx

Model E

- Time 1 PTSS
- Time 1 Appraisal of Uncontrollable
- Time 2 Rumination (Brooding)
- Time 3 PTSS
Models A-E Tested using SEM

Model A

When controlling for initial depression, neither appraisals of control nor brooding rumination predicts anything else (e.g., control appraisal does not predict brooding, and brooding does not predict depression at Time 3). So relations between these variables are likely due to stability in depressive symptoms over time (i.e., depression at Time 1 predicts all outcomes, but other variables don't add to prediction of any outcome beyond Time 1 depression). After the removal of the statistically nonsignificant pathways, this model demonstrates good fit (Chi squared =4.94, p = .177; df = 3; RMSEA = .058; CFI = .988, SRMR = .0362), suggesting it is likely a good representation of relationships among these variables.
Model B

This model is statistically significant and demonstrates an indirect effect relationship, whereby appraisals of control are associated with increased active coping at Time 2, which correlated with decreased Time 3 PTSS. The overall model also demonstrates a good fit at chi square = 3.223 (p= .073). When controlling for initial PTSS, the relationships still hold, with the path between Time 2 active coping and Time 3 PTSS maintaining statistical significance (p = .048). Also, the overall model demonstrates a good fit (chi square = .244; p =.885; df = 2; RMSEA = .000; CFI = 1; SRMR = .0104), though it is difficult to interpret RMSEA when degrees of freedom are small (e.g. 2). The indirect effect was .07, which was statistically significant in a sobel test, z = -1.63, p = .05.
Model C

Again, when controlling for initial depression, the mediational links in the model become statistically nonsignificant. Initial depression is driving this model. With the nonsignificant links removed, the model demonstrates good fit, suggesting this is an accurate representation of relationships (Chi squared = .67; p = .871; df = 3; RMSEA = .000; CFI = 1; SRMR = .0186).
Model D

Appraisals of uncontrollability appear to impact depression as a function of brooding rumination. This model is a good fit. However, when controlling for initial depression, the relationships between uncontrollability and Time 2 rumination brooding became statistically nonsignificant, suggesting that initial levels of depression, anxiety, and stress, are driving the relationship between T2 brooding rumination and T3 depression. With the nonsignificant links removed, the model demonstrates good fit, suggesting this is an accurate representation of relationships (Chi squared = .686; p = .710; df = 2; RMSEA = .000; CFI = 1; SRMR = .0145). The indirect effect from time 1 depressive symptoms to time 3 depressive symptoms with a mediator of brooding rumination was .07, which was statistically significant in a sobel test, $z = 2.10$, $p = .02$. 

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**Diagram:**

- **T1 Depressive sx**
  - 0.485***
  - 0.513***

- **T1 Appraisals of Uncontrollable**
  - 0.513***

- **T2 Brooding Rumination**
  - 0.150**

- **T3 Depressive sx**
Model E

The relationship between appraisals of uncontrollability, brooding rumination, and posttraumatic stress symptoms, while controlling for PTSS, seems to be driven by initial PTSS. Paths between initial Time 1 appraisal and Time 2 brooding rumination, as well as initial Time 1 appraisal and Time 3 PTSS, were nonsignificant. However, Time 2 brooding rumination appears to mediate the relationship between initial PTSS and Time 3 PTSS. When the nonsignificant links were removed, the model demonstrated good fit (Chi squared = 1.796; p = .362; df = 2; RMSEA = .009; CFI = 1; SRMR = .0254).

The indirect effect from time 1 PTSS to time 3 PTSS with a mediator of time 2 brooding rumination was .09, which was statistically significant in a sobel test, z = 2.32, p = .02.
Summary

To sum, Models A, C, D & E demonstrated relationships primarily driven by initial adjustment, or stability in this adjustment over time. However, Model B demonstrated a mediational significant relationship by which increased appraisals of control drove more active coping, which led to lower levels of posttraumatic stress symptoms. Also, Model E demonstrates that initial depressive symptoms led to more rumination which led to still more depressive symptoms. Likewise, Model F shows that initial PTSS is correlated with to more rumination which is associated with more PTSS.

Discussion

Hypothesis one, that the appraised characteristics of events determine the types of cognitive processing in which people engage following a stressor, and hypothesis two, that the type of cognitive processing used will affect adjustment outcomes, were to some extent supported. Our third hypothesis, that mediation models will show that links between appraisals and adjustment are mediated by cognitive processing, was only somewhat supported. However, our fourth hypothesis, that some types of cognitive processing would be helpful in the context of an ongoing stressor, was not. We discuss these conclusions below.

Bivariate Correlations

Some of the bivariate correlations that did not match with previous literature, and limited the model paths to be tested. Namely, only 5 models, including appraisals of controllability, uncontrollability, and challenge emerged. Appraisals of threat and centrality were not
significantly related to either adjustment outcome in our study. This may be because academic stressors are not perceived as essential to college students’ sense of themselves or their futures.

The meaning making coping we assessed appears to be either unhelpful or not very helpful in dealing with a chronic stressor. This is not surprising because meaning making is less helpful for ongoing stressors, especially those stressors that would be amenable to problem-solving. This may be especially so because participants can do some problem solving for ongoing stressors. Some chronic stressors may benefit from meaning making. For example, chronic illnesses are often aided by meaning making processes you need cites. However, ongoing stressors that can be fixed or helped through direct action, or active coping, might not benefit from meaning making. It appears that academic stressors, such as those reported here, are more of the latter, amendable to active coping.

SEM Models

Models A, C, D & F demonstrated relationships primarily driven by initial distress, or stability in this distress over time. There is considerable evidence to indicate that affective symptoms, such as depression and anxiety, are stable to some degree over time. General psychological distress has been shown to be relatively stable during the course of a semester in a college sample (Rice, Richardson, & Clark, 2012). The stability in depressive symptoms over time has been widely supported, and this stability is especially pronounced in late adolescence and early adulthood (Prenoveau et al., 2011). Since most participants in this study are in early adulthood (mean age = 19), this could explain the exceptional persistence in depressive symptoms over time. Additionally, although posttraumatic stress symptoms generally decrease over time (Nygaard, Jensen, & Dyb, 2012), they tend to not within the context of an ongoing, chronic stressor (Cernvall, Alaie, & von Essen, 2012). Since this study prompted for an ongoing
stressor, this may also explain the stability in distress over time that is driving the relationships. Therefore, our hypotheses for models A, C, D & F that appraisals impact coping which impacts adjustment, were not supported. Perhaps a study following these more chronic stressors over time would demonstrate more fluctuation in psychological distress, and therefore allow relationships between cognitive appraisals, cognitive processing, and long term adjustment to emerge, as psychological distress varies more as more time passes (Lambert et al., 1996).

However, Model B demonstrated a significant relationship by which higher levels of appraisals of control drove more active coping which led to less posttraumatic stress symptoms.

*Model B*

Model B demonstrates a relationship by which appraisals of control created more active coping at Time 2, which created less posttraumatic stress symptoms at Time 3, above and beyond Time 1 posttraumatic stress symptoms, or the stability of posttraumatic stress symptoms.
over time. Previous literature has demonstrated that appraisals of control create an increase in active coping (Linley & Joseph 2004), that appraisals of control lead to decreased posttraumatic stress symptoms (Linn, Linn, & Harris, 1982), and that when active coping is used for a controllable stressor, it leads to desirable outcomes like less distress and externalizing behavior (Clarke, 2006) but no study to date has shown this ct relationship whereby appraisals of control impact posttraumatic stress through active coping. So if a student thinks he or she has control over, for example, an academic stressor like choosing a major, he or she engages in more active coping, which is adaptive because there are likely some instrumental things a person can do when a stressor is controllable, which leads to less posttraumatic stress symptoms.

This may mean that, despite experiencing posttraumatic stress symptoms, individuals can still perceive some controllability in their stressful event. Previous studies have shown that posttraumatic stress is highly associated with appraisals of uncontrollability (e.g. Foa, Zinbarg, & Rothbaum, 1992). Even so, not only did individuals in this study who were experiencing PTSS find controllability in their stressful event, but they were able to put in place active coping strategies to deal with this stressor, and decrease their posttraumatic stress. So this model may speak to the resilience of individuals facing very stressful events that create posttraumatic stress symptoms.

While most researchers have posited that that active coping and cognitive processing happen at the same time, cognitive processing has occasionally been studied as preceding active coping. For example, Phelps, Williams, Raichle, Turner, and Ehde (2008) conducted a study of amputees and found that positive cognitive processing led to more active coping which led to positive adjustment outcomes. So perhaps it will also be useful to study these relationships further to see if cognitive processing is a precursor to active coping, which may impact
adjustment. If cognitive processing precedes active coping, this may be another reason why active coping appears to be more strongly related to adjustment outcomes in this study.  

Out of all of the models, this active coping model within the context of a controllable stressor may have emerged to show some indirect effects because active coping has been shown to be useful for dealing with controllable stressors (Clarke, 2006). Additionally, active coping may be has shown to be useful for ongoing stressors, for which this study prompted (Peacock, Wong, & Reker, 1993; Wong, 1993). From a congruence perspective, the perception of a stressor as uncontrollable is expected to elicit cognitive processing and religious coping, because nothing much can be done for such a stressor, except to make oneself feel better through cognitive and spiritual means. Likewise, for a stressor that is appraised to be controllable, more active coping can be utilized. Another reason for the emergence of this model could be the nature of academic stressors. College students regard interpersonal stressors as more meaningful and stressful than other types of stressors, such as academic stressors (Ross, Neibling, & Heckert, 1999).

Also, consistent with the rumination-depression cycle highlighted in previous literature, Model D demonstrates that initial depressive symptoms seems to lead to more brooding rumination which correlates with more depressive symptoms (Nolen-Hoeksema, 2005). This reveals a possible cycle through which depression is maintained, and perhaps elevated, by the presence of the brooding type of ruminative thought. It offers support to a findings and theory in previous literature. The Response Styles Theory suggests that those who ruminate in response to dysphoria will experience more severe and prolonged depressions (Nolen-Hoeksema, 1991). In this vein, brooding types of rumination have been demonstrated to support this theory, that maladaptive rumination impacts the onset and duration of depression and depressive symptoms.
(e.g., Just & Alloy, 1997; Kuehner & Weber, 1999; Nolen-Hoeksema, 2000; Spasojevic & Alloy, 2001). This study provides additional support for this hypothesis. It also provides important insight into a factor that maintains depressive symptoms, and therefore a possible place to intervene (e.g. Watkins et al., 2007).

Similar to Model D, Model E demonstrated that initial PTSS is linked with more brooding rumination which significantly correlates with more PTSS. Rumination has been linked to PTSS (Cox, Kenardy, & Hendrikz, 2008), but this cycle by which PTSS leads to more rumination which leads to more PTSS has not yet been posited. This may be a mechanism though which PTSS are maintained, and may explain in part its stability over time. More work should be done to explore this possible cycle between rumination and PTSS.

Interestingly, depressive symptoms and PTSS were similarly related to both appraisals and adjustment variables. The correlation between these two constructs was high ($r = .78$, $p < .01$), but not high enough to suggest multicollinearity. Additionally, these variables have been tested separately in appraisal literature and in cognitive processing and coping literature, therefore we found it important to test them separately in this study. The high correlation between PTSS and depressive symptoms, as well as PTSD and depression, has been noted in previous literature (e.g. Blanchard, Buckley, Hickling, & Taylor, 1998). There is symptom overlap between these two constructs, as well as underlying general distress. Attempts at teasing apart general distress from unique portions of depressive symptoms versus PTSS should be made in the future, in order to determine if and how depression and PTSS function differently in terms of appraisal, coping, and adjustment to long term stressful events.
Limitations

While these findings are important in extending our understanding of relations among appraisals, cognitive processing, and adjustment to stressful events over time, limitations of the study must acknowledged. First, we examined only 3 time points in a stress and coping process that occurs over extended periods of time. Many of the events were ongoing likely long before as well as long after the study period, meaning we could only examine a brief snapshot, which may limit the extent to which our study truly depicts these processes as they unfold.

Further, analyzing an SEM model whereby a Time 2 variable predicts a Time 3 variable beyond a Time 1 variable (i.e., Time 1 IV -> Time 2 med -> Time 3 DV) has the confound of proximity in time (e.g., Time 2 mediator should be a stronger predictor of Time 3 than Time 1 simply because it was measured closer time point). Adding the Time 1 level of DV (in this case, adjustment) helps because this allows one to examine the process by which the IV (appraisal) impacts the DV (adjustment) beyond stability in in this wellbeing or distress--the process may not be direct but rather indirect through the mediator, or cognitive processing mechanism.

The sample may be biased in unknown ways. Participants chose to register for the study entitled “Event Appraisals, Cognitive Processing, and Adjustment,” and therefore this sample may be different than the rest of the University of Connecticut participant pool population, either more willing to discuss negative events and adjustment, or may have more events or stressors that they would like to talk about. The participant pool sample was demographically representative of the University of Connecticut population, but may not may not be generalizable to a broader population, a problem often noted in studies of college undergraduates.

Additionally, since 61.3% of the ongoing stressors reported were academic stressors, participants may have been responding in a way that may be unique to academic stressors rather
than other types of stressors. These may also not be the type of stressor that would elicit
cognitive processing, as demonstrated by previous research (LoSavio et al., 2011). However, we
did ask for an ongoing stressor in order to prompt for more chronic stressors, which would elicit
more cognitive processing. Additionally, there was a high degree of core belief disruption (2.83),
indicating stressful events that would likely initiate cognitive processing. Again, core belief
disruption refers to the degree to which a stressor challenges an individual’s views of the world.
Stressful events that disrupt the assumptive world can force people to make changes to
accommodate these highly stressful experiences (Cann et al., 2010).

We examined a stressful event that was ongoing, in order to prompt for a stressor that
would be distressing enough to create the need for cognitive processing and coping, and last
through the duration of the study (2 months). However, few studies have examined ongoing
stressful situations (e.g., Folkman, Lazarus, Dunkel-Schetter, DeLongis, & Gruen, 1986).
Cognitive processing in ongoing situations may have different effects than it does for situations
that are single-event occurrences that end and whose aftermath must be dealt with cognitively.
That is, it may be that active coping approaches are as helpful as or even more helpful in these
ongoing situations than is cognitive processing. In future studies, both more studies involving
improved methodology for acute stressors, as well as more studies examining the differences
between these and more chronic stressors, are warranted. Additionally, cognitive processing and
active coping were not directly compared in the same models. In order to compare the
helpfulness of these types of processing and coping within an ongoing stressor, direct model
comparisons in SEM should be made.

Additionally, we examined only potential meditational relationships between those
variables that have been linked in previous literature. It would be both useful and important to
explore relationships between appraisals, cognitive processing/coping, and adjustment that have not been previously shown to be related (e.g. reflective rumination).

While using path modeling to estimate direct and indirect effects in meditational models in SEM hints at causality, it is still primarily correlational (Pearl, 2012). It is as close as one can get to analyzing outright causal links in relationships, though, In fact, Shpitser and Pearl (2006) imply that SEM operates at the boundary of this relationship; no method can do better without strengthening the assumptions. SEM is also considered the gold standard for mediation modeling. It will be important to examine additional path models and more causal links in the future.

Conclusion

In spite of these limitations, our results advance our understanding of adjustment following events that cause or exacerbate posttraumatic stress symptoms. In particular, our findings suggest that those experiencing posttraumatic stress symptoms, at least in the context of predominantly academic stressors in college students, show resilience. In these situations, they are able to perceive controllability in their event, and actively cope, which decreases their posttraumatic stress symptoms. Additionally, active coping seems to be particularly useful for ongoing academic stressors. The usefulness of cognitive processing should be studied in the context of different types of ongoing stressors.


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<table>
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<tr>
<th>Event Type</th>
<th>Example</th>
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<tbody>
<tr>
<td>Academic</td>
<td>“Academic workload stress”</td>
</tr>
<tr>
<td></td>
<td>“Maintaining good grades”</td>
</tr>
<tr>
<td></td>
<td>“Applying for graduate school”</td>
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<tr>
<td>Interpersonal</td>
<td>“Death in family”</td>
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<tr>
<td></td>
<td>“Roommate issues”</td>
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<tr>
<td></td>
<td>“Gaining my parents’ trust back”</td>
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<tr>
<td></td>
<td>“Maintaining a long distance relationship”</td>
</tr>
<tr>
<td>Sports</td>
<td>“Rowing”</td>
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<tr>
<td></td>
<td>“Running cross country and track races”</td>
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<tr>
<td>Illness</td>
<td>“An undiagnosed chronic illness”</td>
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<tr>
<td>Balancing Time</td>
<td>“Balancing schoolwork and down time”</td>
</tr>
<tr>
<td></td>
<td>“Balancing school, pledging, sleeping, and health”</td>
</tr>
<tr>
<td>Job</td>
<td>“Figuring out my career”</td>
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<tr>
<td></td>
<td>“Working too much”</td>
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<tr>
<td>Other</td>
<td>“Living away from family”</td>
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Table 2:

*Bivariate Correlations of Time 1 Appraisals with Time 2 Cognitive Processing and Coping*

<table>
<thead>
<tr>
<th>Time 2 Cognitive Processing/Coping</th>
<th>Time 1 Appraisals</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Control</td>
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<tr>
<td>Positive Reinterpretation Coping</td>
<td>.51***</td>
</tr>
<tr>
<td>Religious Coping</td>
<td>.20*</td>
</tr>
<tr>
<td>Brooding Rumination</td>
<td>-.22*</td>
</tr>
<tr>
<td>Active Coping</td>
<td>.38***</td>
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</table>

Note. *p < .05, **p < .01, ***p < .001
Table 3: Bivariate Correlations of Time 1 Appraisals with Time 3 Adjustment

<table>
<thead>
<tr>
<th>Time 1 Appraisals</th>
<th>Time 3 Adjustment</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Depressive Symptoms</td>
</tr>
<tr>
<td>Control</td>
<td>-.26**</td>
</tr>
<tr>
<td>Uncontrol</td>
<td>.37**</td>
</tr>
<tr>
<td>Threat</td>
<td>.19*</td>
</tr>
<tr>
<td>Central</td>
<td>.01</td>
</tr>
<tr>
<td>Challenge</td>
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Note. * p < .05, ** p < .01, *** p < .001
Table 4: Bivariate Correlations between Time 2 Cognitive Processing Strategies and Active Coping with Time 3 Adjustment

<table>
<thead>
<tr>
<th>Time 3 Adjustment</th>
<th>Time 2 Cognitive Processing</th>
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<tbody>
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<td>Positive Reinterpretation Coping</td>
</tr>
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<td>Depressive Symptoms</td>
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<td>PTSS</td>
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Note. * $p < .05$, ** $p < .01$, *** $p < .001$
Table 5: Correlations between Time 1 Appraisals, Time 2 Cognitive Processing and Coping, and Time 3 Adjustment

<table>
<thead>
<tr>
<th>Time 1 Appraisals</th>
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<table>
<thead>
<tr>
<th>Time 2 Cog Processing/Coping</th>
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<tbody>
<tr>
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<td>Religious Coping</td>
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<tr>
<td>Brooding Rumination</td>
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<tr>
<td>Active Coping</td>
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$p < .05$, ** $p < .01$, *** $p < .001$
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Table 6: Bivariate Correlations between Cognitive Processing/Coping Variables, Time 2
Table 7:

*Means and Standard Deviations of All Variables at Time 1*

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<tr>
<th></th>
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<th>Standard Deviation (SD)</th>
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