

THESIS

MEANING IN LIFE, UNCERTAINTY, AND DEPRESSIVE SYMPTOMATOLOGY

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Jessica L. Morse

Department of Psychology

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Master's Committee:

Advisor: Michael F. Steger

Bryan J. Dik

Lauren B. Shomaker

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## ABSTRACT

### MEANING IN LIFE, UNCERTAINTY, AND DEPRESSIVE SYMPTOMATOLOGY

One important aspect of well-being, perceived meaning in life, is associated with good psychological health and reduced psychopathology (e.g. Ryff, 1989, Steger, Frazier, Oishi, & Kaler, 2006). Disposition toward uncertainty is also implicated in well-being and psychopathology. Rating uncertainty as intolerable is correlated with various forms of mental illness and distress (e.g. Koerner & Dugas, 2008; Dugas, Gosselin & Ladouceur, 2001). The current studies explore how meaning in life and response to uncertainty influence depressive symptomology in samples of undergraduate students. Study 1 examined correlations among meaning in life, intolerance of uncertainty, and depressive symptomology. In Study 2, an experiment was conducted to investigate how levels of uncertainty salience influence individuals' responses to ambiguous information and resulting depressive symptoms. Results indicated that higher levels of meaning in life significantly relate to lower levels of depressive symptoms and more tolerance of uncertainty. Study 2 explored interactions between perceived meaning in life and tolerance for uncertainty in predicting depressive symptoms based on randomly assigned uncertainty-salience conditions. Several moderation analyses supported hypotheses that presence of meaning attenuated the relationship between intolerance of uncertainty, uncertainty condition, and depressive symptoms. Explanations for the relationships found are discussed, and alternative interpretations, including the possibility that the elicitation of uncertainty prompted participants to actively make meaning of their experience, are examined.

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## **CHAPTER 1: Introduction**

At the very root of human nature is a deep-seated need to feel that our lives are meaningful. A meaningful life is judged subjectively, yet most theories suggest that people feel their lives are meaningful when they understand who they are, how they fit in the world around them, and feel as though they matter (e.g., Epstein, 1985; Heine, Proulx, & Vohs, 2006; Janoff-Bulman, 1992; Ryff & Singer, 1998). These three components correspond to coherence, purpose, and significance and make up presence of meaning (PM) as outlined in Martela and Steger's (2016) theory of meaning in life.

Meaning in life has been studied extensively in relation to well-being and mental health. High PM serves many protective functions, including improving individuals' well-being (e.g. Ryff, 1989) and life satisfaction (Steger et al., 2006; Steger & Kashdan, 2007) as well as buffering individuals from the negative effects of stressful life events (Park, 2010). Low PM is tied to symptoms of anxiety, post-traumatic stress, and depression (see Steger, 2013 for review). Individual differences in personal resources like PM help to explain how people diverge in responding to stressful situations and the varying ramifications of stress on physical and psychological health. Yet, how and why PM contributes to these differences in response to stressors and outcomes is not well understood.

Stress often arises from uncertainty. People vary in how they tolerate uncertainty, as some find uncertainty exciting and stimulating, while others find it highly aversive (Rosen, Ivanova, & Knauper, 2013). Those individuals who attribute negative qualities to uncertain stimuli are more likely to experience increased worry (Freeston et al., 1994), to hold onto pessimistic certainty about future happenings (Dupuy & Ladouceur, 2008; Yook et al., 2010), and to maintain inflexible and irrational beliefs related to uncertainty (Berenbaum et al., 2008).

The purpose of this study is to test the role of meaning as it interacts with people's difficulties managing uncertainty, with implications for depressive symptoms.

### **Meaning in Life**

In the aftermath of World War I, philosophers began to question how any sense could be made of the tremendous human cost of war, and the seemingly inexplicable reasons for such conflicts. As a traumatized Europe faced the march to yet another needless war, Viktor Frankl (1963) began to develop his theory that humans have a deep and fundamental need to find meaning in struggle, conflict, hardship, and indeed all of the events that make up human life. Thus, in a very real sense, psychology's study of meaning in life is rooted in the struggle to find meaning in the apparently meaningless, certainty in the uncertain.

There is a vast body of literature on meaning in life and related concepts in the fields of psychology, philosophy, and religion. As one might expect from a topic that is debated across multiple disciplines, a range of distinctions, facets, and dimensions have been proposed for meaning. In psychology, the primary distinctions are between existential or personal meaning (e.g. "The meaning of my own life," Frankl, 1963; Mascaro & Rosen, 2005 & 2008) versus cosmic or spiritual meaning (e.g., "The meaning of life, the universe, and everything,"; Mascaro & Rosen, 2005 & 2008), as well as between global meaning (e.g., "The meaning of my own life,") versus situational meaning (e.g., "The meaning of this important event," Park, 2010). As the terms are conventionally used, meaning in life, or simply meaning, refers to the meaning one finds in one's own life, rather than specific events or the entire universe. Meaning in life research attempts to uncover individuals' subjective experiences and probes individuals' experiences of meaningfulness in their own lives (Martela & Steger, 2016).

The key components of “meaning in life” have been investigated by psychologists and other interested parties for decades. Research since Frankl’s (1963, 1965) pioneering publications has come to define meaning in life in terms of two principal facets: coherence and purpose. Coherence, or comprehension, refers to the extent to which experiences in life “make sense”, or that someone understands him or herself and his or her world (Steger et al., 2009). Purpose signifies one’s core aims and aspirations (Martela & Steger, 2016) or “what people are trying to do to enact their values” (Steger, 2016, pp. 4). As the psychological study of meaning in life rapidly expands, researchers question the adequacy and accuracy of these two factors in fully explaining meaning in life. Several researchers working in this area support a three dimensional definition of meaning in life, adding “significance” as the third factor (e.g., Park & George, 2013; Steger, 2016; Martela & Steger, 2016). Significance refers to the sense that one’s life matters and is worth living (Martela & Steger, 2016). According to Steger (2016, pp. 3), “meaning in life is the set of subjective judgments people make that their lives are (a) worthwhile and significant, (b) comprehensible and make sense, and (c) marked by the embrace or pursuit of one or more highly valued, over-arching purposes or missions.” In this three-facet model, coherence represents the cognitive, purpose the motivational, and significance the evaluative aspects of meaning in life (Steger, 2016).

As the definition of meaning in life is refined, there is a growing body of research that recognizes the experiencing of meaning as central to human nature and at the core of happiness and well-being (Steger, 2016). PM is tied to psychological well-being (Ryff, 1989; Steger & Frazier, 2005; Steger et al., 2006), adaptive coping (Park & Folkman, 1997), life satisfaction (Steger & Kashdan, 2006), happiness (Peterson, Park & Seligman, 2005), positive affect (King et

al., 2006b), positive self-image (Stillman et al., 2009), and coherent sense of self (Heine, Proulx, & Vohs, 2006).

Although links between PM and well-being and mental health are substantiated empirically, explanations about how and why meaning contributes to such outcomes is largely supported only in theory. Park's (2010) meaning-making model supposes that we each have a framework that integrates our beliefs about the world, our goals, and our subjective sense of purpose into a global meaning system. This framework provides us with a sense of predictability, stability, consistency, and a perspective from which to interpret the world (Park, 2010).

According to this theory, people experience stress when their evaluation of a situation counters their global meaning system (Park, 2010). When this occurs, individuals strive to make meaning by modifying their initial appraisal of the situation or altering their global meaning framework (Steger, Owens, & Park, 2014). When unable to make meaning out of a stressful event, individuals experience distress and may be more susceptible to psychopathology (Steger et al., 2014).

Heintzelman and King (2014) also theorize about how individuals find meaning, labeling these as *sources* of meaning. They indicate that predictability of the environment provides a baseline source of meaning for all individuals. Humans inherited the evolutionary advantage of detecting patterns and connections in the world, which creates a framework or lens through which individuals perceive everyday happenings (e.g., Steger, 2009; Steger, Hicks, Krueger, & Bouchard, 2011). These suppositions are detailed in the *Meaning Maintenance Model* (MMM; Heine, Proulx, & Vohs, 2006), where meaning is described as “expected relationships or associations that human beings construct and impose on their world” (Heine et al., 2006, p. 90). MMM is based on the presumption that humans need to make sense of their world in order to

experience meaning. Heintzelman and King (2014b) expand upon this assertion, arguing that individuals “feel” a sense of meaning when they experience the cognitive or coherence component of meaning that comes from detecting patterns in the environment. This feeling is reassuring in that it provides us with a sense that the world is predictable, that we have some level of control or efficacy, and that reduces distress. Individuals seek this feeling of meaning and thus they approach or seek situations that fit into their lens- stories, interactions, perceptions --that enhance their sense of coherence and, in turn, their sense of identity and self-efficacy (Steger, 2016). According to MMM, experiences that dismantle coherence detract from one’s subjective sense of meaning (Heintzelman & King, 2013). Stimuli that provoke uncertainty are especially profound in destabilizing perception of order, reducing one’s sense of meaning and typically activating an individual’s sense-making processes (e.g. Heine, Proulx, & Vohs, 2006; Park, 2010).

Baumeister (1991) similarly emphasizes the coherence component in his definition of meaning. According to Baumeister (1991), the sense that one’s life is meaningful comes from four sources: purpose, self-efficacy, values, and positive self-worth. Purpose denotes an individual’s perception that current activities will result in a desired effect on future outcomes, which imbues the current activities with meaning (e.g. reading a psychology text is purposeful because it is expected to benefit one’s future career, thus it has meaning). Value relates to an individual’s sense that his or her actions are moral and good (Stillman & Baumeister, 2009). Efficacy provides individuals with a sense of control over outcomes (Stillman & Baumeister, 2009), and positive self-worth refers to an individual’s perception of oneself as a good person (Stillman & Baumeister, 2009). Uncertainty that one’s current actions will produce desired future outcomes detracts from one’s sense of purpose and, in turn, one’s sense of control, predictability,

self-worth, and meaning (Stillman & Baumeister, 2009). Thus, uncertainty about oneself and one's ability to effect desired change destabilizes one's sense of coherence and sense of meaning.

Although these theories indicate that meaning might provide people with a sense of certainty, there is not extensive empirical support as to how and why meaning might relate to certainty in contributing to well-being. Meaning in life research has made a tacit acknowledgement of the importance of certainty through research on people's search for meaning. Search for meaning (SM) refers to "the strength, intensity, and activity of people's desire and efforts to establish and/or augment their understanding of the meaning, significance, and purpose of their lives" (Steger, Kashdan, Sullivan, & Lorentz, 2008a, p. 200). SM and PM are inversely related in most populations (e.g., Steger et al., 2006; Steger et al., 2008) with SM typically correlating with lower ratings on indices of well-being (N. Park, M. Park, & Peterson, 2010). Culture, age, and PM may moderate the relationship between SM and well-being. For example, Steger, Kawabata, Shimai, and Otake (2008) found positive correlations between SM and PM among Japanese university students. Additionally, SM relates to lower well-being and is less common in younger adults versus older adults (Allan, Duffy, & Douglass, 2015; Steger, Kashdan, & Oishi, 2008b). Research also indicates that SM in individuals who endorse high PM does not lead to experiencing lower well-being (N. Park et al., 2010) or reductions in life satisfaction (Steger, Oishi, & Kesebir, 2011). Thus, PM might be protective against the reductions in well-being that typically coincide with SM and perhaps for those individuals that find uncertainty disconcerting. Searching for meaning without finding meaning may contribute to feelings of hopelessness and helplessness that might preclude or coincide with other

depressive symptoms. Generally, these findings provide the context for exploring how people tolerate uncertainty in their lives and how PM may reduce risk for depression.

## **Depression**

Clinical levels of depression are estimated to impact 7-8% of US adults (American Psychiatric Association (APA), 2013)) while mild depressive symptomatology affects many more. Amongst college students, depression is a leading contributor to seeking mental health services (Novotney, 2014) and mild depressive symptoms are estimated in up to 30.6% of undergraduates (see review by Ibrahim, Adams, & Glazebrook, 2013). Depression exists on a spectrum with those suffering from severe depressive disorders meeting most or all criteria for Major Depressive Disorder (MDD) and others endorsing only a few symptoms. Depressive disorders are generally characterized by “the presence of sad, empty, or irritable mood, accompanied by somatic and cognitive changes that significantly affect the individual’s capacity to function” (APA, 2013). Symptoms of depression include negative outlook (APA, 2013), loss of interest or pleasure in previously enjoyed activities (APA, 2013), hopelessness (Dupuy & Ladouceur, 2008) and despondency (Dupuy et al., 2008). Depression is heterogeneous in presentation, severity, duration, and prognosis. Individuals with depression typically report some level of impairment in daily activities; in fact, depressive disorders are the most common cause of disability for male and female adolescents and young adult women (Gore et al., 2011). Above and beyond the crippling impact of depressive symptoms on psychological functioning, depression is also tied to chronic physical health conditions and poor physical health (Katon, 2004; Wells et al., 1989).

There are numerous theories that attempt to explain why depression develops in an individual in the form and at the time that it does. Cognitive theories of depression provide one

perspective on the etiology and development of depressive disorders and are particularly relevant to this study as both meaning in life and intolerance of uncertainty focus on how people think about themselves and perceive events in their lives. Cognitive theories of depression purport that how people attend to, interpret, and recall events contributes to vulnerability for depression. Beck's (1967) cognitive theory of depression asserts that depressive symptoms originate from maladaptive beliefs and dysfunctional thought processes. This theory specifies a cognitive depressive triad of negative beliefs, proposing that individuals develop maladaptive beliefs and predictions about the future that negatively bias their future-event schemas. These negatively-skewed thoughts and expectations are depicted as a vulnerability to developing depressive symptoms when some stressor overwhelms the individual's coping abilities. Another cognitive theory, the Hopelessness theory of depression (HP; Abramson, Metalsky, & Alloy, 1989) proposes that a propensity toward making negative inferences about life events, the self, the future, and/or the world creates risk for depression when an individual encounters a stressor because the nature of the inferences promotes feelings of hopelessness.

The Response-Styles theory of depression (RST; Nolen-Hoeksema, 1991) provides a different cognitive perspective than Beck's cognitive theory and HP in that it focuses on how an individual responds to his or her negative emotions or depressive symptoms. RST suggests that people's response style, or the ways in which they react to their experience of depressive symptoms, impacts the maintenance of those symptoms. Individuals that engage in rumination, which involves focusing attention on depressive symptoms and the consequences of those symptoms, experience prolonged and intensified depressive symptoms due to increased accessibility of negative events in memory, enhanced recall of negative events, a proclivity toward negative interpretations of events, and feelings of reduced self-efficacy in controlling

outcomes (Nolen-Hoeksema, 1991). Rumination may also hinder engaging in problem-solving behaviors that could effectively reduce depressive symptoms (Nolen-Hoeksema, 1991). Overall, individuals who respond to depressive symptoms by ruminating about them rather than engaging in problem-solving or other positively reinforcing behaviors experience more intense and prolonged depressive symptoms (Nolen-Hoeksema, 1991).

Cognitive avoidance, or avoidance of examining the accuracy and impact of one's thoughts, is also proposed to contribute to the development of depressive symptoms (e.g. Jacobson et al., 2001; Martell, Addis, & Jacobson, 2001). Ottenbreit and Dobson (2004) found behavioral and cognitive avoidance moderately positively correlated with depressive symptoms. Behavioral avoidance can contribute to or worsen depressive symptoms as depressed individuals who disengage from activities may lose access to interpersonal interactions and other potentially rewarding experiences. Reduced engagement in activities like social events, dating, and job interviews, may result in loneliness, loss of interest, and other depressive symptoms (Kashdan, 2011). Cognitive avoidance, which involves disengagement from the reappraisal of negative thoughts, maintains distorted beliefs and contributes to persistent depressive symptoms years after the onset of a depressive disorder (Blalock et al., 2000). Avoidance and rumination are both cognitive strategies that perpetuate depressive symptoms as the individual engages in avoiding or distracting from one's experience or overly engaging with one's thoughts in an ineffective manner.

One reason why individuals may engage in these cognitive strategies is to reduce the distress that they experience when they interpret an event as ambiguous and feel uncertain. Research indicates that individuals who find uncertainty intolerable are vulnerable to interpreting ambiguous everyday events negatively and perceiving that they lack the skills to effectively

manage uncertain situations. Thus, it may also be that people who find uncertainty particularly intolerable are more likely than their more uncertainty-tolerant peers to interpret stimuli in the environment as ambiguous and stressful and then to experience depressive symptoms as result of employing ineffective strategies (i.e., rumination, avoidance) to cope. Such reactions to fairly common daily stressful experiences may result in negative mood and lowered self-esteem, both of which increase risk for depressive symptoms (Yook, Kim, Suh, and Lee, 2010).

### **Meaning and Depression**

PM provides a sense of coherence, motivation, direction, structure, and hope as individuals strive toward fulfilling their perceived purpose, and thus can protect individuals from developing depressive symptoms (Mascaro & Rosen, 2005). Findings indicate that PM correlates negatively with depression (e.g., Mascaro & Rosen, 2005 & 2008; Park, 2010; Steger & Kashdan, 2009; Steger, Mann, Michels & Cooper, 2009; Sorajjakool et al., 2008; Kleftaras & Psarra, 2012). There are several reasons why this might be the case. In this section, interpersonal relationships, goal achievement orientation, and tolerating uncertainty will be explored as possible protective factors conveyed by PM.

One mechanism through which PM may protect against depressive symptoms is through the social connectedness that develops in interpersonal relationships. Social connectedness is described frequently in the literature as a source of meaning (e.g., Steger & Kashdan, 2009). It is theorized that interpersonal connection and sense of belonging contribute to a sense of increased efficacy and competence, which boost meaning in life (Aron and Aron, 2013). Individuals who are socially excluded rate their lives as less meaningful in comparison to controls (Twenge, Cantanese, & Baumeister, 2003), and individuals who feel ostracized or forgotten report lower PM (King & Geise, 2011). Feeling “known” taps into the very essence of mattering, a key

component of meaning in life (Martela & Steger, 2016). Relatedly, individuals who report a high level of PM are judged as more desirable social partners in comparison to those individuals who rate their lives as lacking PM (Stillman et al., 2011). Based on this research, those who experience high levels of PM may be more likely to have more social opportunities, interactions, and relationships, which may reduce the likelihood of developing depressive symptoms like loneliness, isolation, dejection, and negative self-perception.

Theorists also implicate goal achievement orientation as a mechanism through which PM may protect against the development of depressive symptoms. Individuals driven by validation-seeking are more concerned about proving themselves - their competence, worth, and likability - than their growth-seeking counterparts (Dykman, 1998). Individuals with a validation-seeking goal orientation may be more likely to develop depressive symptoms due to higher sensitivity around competence and self-worth in relation to achievement (Dykman, 1998). When individuals rely on external sources of feedback about self-worth, they are more susceptible to questioning who they are and how they contribute to the world around them when they receive negative or invalidating feedback. Questioning oneself and one's value to the world likely detract from one's sense of coherence and purpose. When understanding of the self and how one fits in the world are damaged, research suggests that overall sense of meaning in life declines (e.g., Park, 2010). Further support for the connection between goal achievement, the purpose component of meaning in life, and depression comes from Kleftras and Psarra's (2012) findings that reaching one's goals significantly differentiated between levels of depressive symptomology in their sample. Achieving goals, which contributes to one's sense of feeling purposeful and efficacious, negatively correlated with depression symptoms. On the other hand, invalidation of one's self or

interference in achieving one's goals may detract from PM and, in turn, trigger depressive symptoms.

A related mechanism through which meaning in life could contribute to development of depressive symptoms is through uncertainty, specifically the way in which some individuals struggle to tolerate uncertainty. Frankl (1963) suggests that maintaining a sense of meaning provides resiliency and promotes hope. If meaning offers coherence, purpose, and a sense of mattering, then it may reduce the distress that uncertainty in everyday life can trigger by providing the individual with a robust structure from which to make sense of new information. For individuals with high PM, it seems less likely that encountering uncertainty would destroy their meaning frameworks, while those individuals low in PM may be easily unnerved by uncertainty, especially if they interpret uncertain stimuli as threatening.

### **Uncertainty**

Uncertainty refers to an internal state of doubt (Rosen et al., 2013). Experiencing uncertainty provokes varying degrees of discomfort, distress, and other psychological consequences for individuals (Rosen et al., 2013). There are a number of terms used to describe individuals' trait-like tendencies in relation to doubt. Generally, psychological perspectives on uncertainty indicate that individuals tolerate ambiguous situations to different degrees. At one end of the spectrum, there are individuals who seek out novel, highly ambiguous experiences and encounter new information with little distress. At the other end of the spectrum, there are individuals who find uncertain or ambiguous situations highly intolerable, distressing, and otherwise negative.

Crucial theories that explain how individuals experience, respond to, and cope with "uncertainty" include: Terror Management Theory (TMT; Greenberg, Pyszczynski, & Solomon,

1986), Uncertainty-identity theory (UIT; e.g., Hogg, 2007b), and the Uncertainty Management Model (UMM; Van den Bos, 2001). TMT posits that humans experience anxiety as they ponder their own mortality and the inevitability of death. According to TMT, we attempt to buffer ourselves from this anxiety by adhering to structured cultural worldviews that provide a stable comprehension of self and life experiences. This sense of coherence provides meaning that protects against the anxiety provoked by contemplating mortality (Becker, 1973).

UIT is similar to TMT in that adhering to cultural worldviews or identifying with a group is recognized as a defense against mortality or other uncertainty-provoking stimuli. UIT is based on the premise that uncertainty about oneself is most disconcerting and that individuals try to reduce uncertainty especially when it creates a sense of confusion about identity, beliefs and other aspects of self deemed important to the individual (Hogg, 2009). Hogg (2009) asserts that people strive for a sense of place in the world, seeking a sense of predictability and trust in one's surroundings. Without a sense of knowing oneself, one's place in the world is unfathomable, thus self-uncertainty is highly disturbing. UIT indicates group identification as an individual's "go-to" protection against self-uncertainty. Much of the research involving UIT revolves around group identification and defense of group worldviews as indirect measures of uncertainty tolerance (Hogg, 2007; Hohman & Hogg, 2015).

UMM provides a slightly different take on uncertainty. UMM identifies *personal* uncertainty as the core threat to meaning in life, identifying it as critical to self-regulation, existential sense-making, and worldview defense (van den Bos, 2009). Personal uncertainty in UMM is defined as, "a subjective sense of doubt or instability in self-views, worldviews, or the interrelation between the two... personal uncertainty is the feeling that you experience when you feel uncertain about yourself" (Van den Bos, 2009, pp.198). Uncertainty about one's attitudes,

beliefs, values, perceptions, and relationships is typically experienced as uncomfortable and aversive (e.g., Hogg, 2007; Sorrentino & Roney, 1986; Van den Bos & Lind, 2002) and can lead to increased physiological arousal and sustained activation of the hypothalamic-pituitary-adrenal axis in the brain (Greco & Roger, 2003). Based on the psychological and physiological consequences, personal uncertainty typically motivates behavior that reduces feelings of uncertainty about oneself (van den Bos, 2009). People react to and cope with feelings of personal uncertainty by processing newly received information in experiential-intuitive ways (cognitive-experiential self-theory; Epstein, 1990). Specifically, people respond in a strongly positive manner to events that fit with their cultural worldviews and in strongly negative ways to experiences that counter their worldviews (Maas & Van den Bos, 2009b; Van den Bos, 2007). According to van den Bos (2009), this response occurs because people cannot tolerate high levels of personal uncertainty; they need to reduce or reconstruct personal uncertainty in order to feel certain about their world and their place within the world. They do so by adhering more strongly to cultural norms or values (e.g. fairness: van den Bos, et al., 2005; heroes: Veltkamp, Aarts, & Custers, 2008).

While UIT focuses on uncertainty as motivating group identification (Hogg, 2009), UMM places emphasis on defense of worldviews and values to manage personal uncertainty. UMM assumes people are ‘existential meaning makers’ (Van den Bos, 2009) and that personal uncertainty is experienced as aversive because it threatens one’s sense of meaning. TMT narrows the focus of uncertainty to uncertainty about mortality, or mortality salience. Consideration of one’s mortality is assumed to be aversive and motivates efforts within the individual to defend worldviews (Greenberg et al., 1986).

Despite differing in types or sources of uncertainty and actions taken to respond to uncertainty, UIT, UMM and TMT all identify uncertainty as aversive and indicate that people react against uncertainty in self-protective manners. Further, studies examining uncertainty salience and mortality salience often result in comparable results when measured in identical contexts (Wichman, Brunner, & Weary, 2008)

Embedded in the above theories are various kinds of uncertainty. In their systematic review of the literature, Rosen et al. (2013) distinguish between the related concepts of Intolerance of Uncertainty (IU), Intolerance of Ambiguity (IA), Need for Cognitive Closure (NCC) and Uncertainty Orientation (UO). IU focuses on measuring the psychological effects of uncertainty, while NCC and UO map onto a motivational spectrum of desire for closure and approach/avoidance of uncertainty, respectively. IA and IU both attempt to describe and measure cognitive, emotional and behavioral consequences of experiencing uncertainty. Another related construct, Personal Need for Structure (PNS; Neuberg & Newsom, 1993), is defined as a “dispositional desire for structured knowledge” (Vess, Routledge, Landau, & Arndt, 2009, pp. 728) and is used most frequently in the literature alongside mortality salience in the context of TMT. Individuals who have a low need for personal structure are more tolerant of ambiguity, while structure appeals to those high in PNS, as they prefer to organize events and thoughts in a clear, orderly manner. High-PNS individuals rely on pre-existing cognitive structures to process new information to reduce complexities and ambiguities, while low-PNS individuals are more flexible in, and perhaps eager to, engage with new information (Vess et al., 2009).

IA (Frenkel-Brunswik, 1949; Budner, 1962) is defined as “the individual’s tendency to interpret an ambiguous situation as a threat or a source of discomfort” (Grenier, Barrette & Ladouceur, 2005, pp. 594). According to Grenier et al. (2005), IA involves cognitive, emotional

and behavioral reactions to ambiguous stimuli. Cognitive reactions include perceiving ambiguous stimuli in rigid, black and white terms, while emotional reactions include anxiety, anger and dislike, and behavioral reactions include avoidance and rejection of ambiguous situations (Grenier et al., 2005). IA is frequently used in the social psychology literature and has limited ties to mental health.

On the other hand, IU (Freeston, Ladouceur, Letarte, & Rhéaume, 1994) is prevalent in the clinical and health psychology literature and has been primarily researched in relation to mental health. IU is defined as “the tendency to react negatively on an emotional, cognitive and behavioral level to uncertain situations and events” (Dugas, Buhr, & Ladouceur, 2004, p. 143). IU is characterized as a disposition toward negatively construing uncertainty and concern about the consequences of uncertainty. Some define it as a cognitive bias (Dugas et al., 2004) that serves as a filter wherein individuals high in intolerance perceive and respond to uncertain situations negatively and may attempt to avoid uncertainty-provoking stimuli or situations to reduce distress. IU is composed of various features, including inflexible beliefs around uncertainty, the desire for predictability, and the tendency to become paralyzed and to experience distress in the face of uncertainty (Berenbaum, Bredemeier, & Thompson, 2007). Generally, models of IU indicate that individuals who are highly intolerant of uncertainty perceive stimuli as uncertain more often and perceive uncertain stimuli as more threatening, disturbing (Ladouceur, Gosselin, & Dugas, 2000), stressful and upsetting (Dugas et al., 2005). IU may lead to the inability to act in response to an uncertain situation (Dugas et al., 2005) and avoidance of uncertainty-laden experiences (Gentes & Ruscio, 2011).

Of all these uncertainty-related constructs, IU appears most frequently in the study of mental illness. IU is associated with worry (e.g., Buhr & Dugas, 2002; Dugas, Freeston, &

Ladouceur, 1997), increased stress (e.g., Greco & Roger, 2003), fear (Barlow, 2002), and avoidance (Carleton, 2012). Many studies connect IU to anxiety and anxiety disorders (e.g. Koerner & Dugas, 2008; Dugas, Gosselin & Ladouceur, 2001; Behar, DiMarco, Hekler, Mohlman, & Staples, 2009; Fisher & Wells, 2009; Carlton, 2012) and depression (e.g., Dugas, Freeston, Blais & Ladouceur, 1994; Yook et al., 2010; Duronto, Nishida, & Nakayama, 2005; Sorrentino, Holmes, Hanna, & Sharp, 1995; Dupuy & Ladouceur, 2008). Although IU appears to be the best candidate for research into mental health as evidenced by the abundance of previous research, the overlap of the abovementioned constructs and their underlying theories indicate that incorporating multiple measures of uncertainty may provide clarification and differentiation between uncertainty constructs and measures.

### **Uncertainty and Depression**

There is an expanding body of research implicating IU in the development of depressive symptoms and depressive disorders. A longitudinal study found that increases in IU predicted increases in depression (Miranda, Fontes, and Marroquín, 2008). In non-clinical samples, studies result in moderate to strong positive correlations between IU and depression (e.g. Boelen, Vrinssen, & vanTulder, 2010; Butzer & Kuiper, 2006; de Jong Meyer, Beck, & Riede, 2009). Similar correlations are reported in clinical outpatient samples (McEvoy & Mahoney, 2011, 2012; de Jong Meyer, Beck, & Riede, 2009) and in individuals diagnosed with MDD (Gentes & Ruscio, 2011).

There are several potential explanations of the link between IU and depressive symptomatology. IU is conceptualized as a cognitive bias that is maladaptive (Buhr & Dugas, 2006) and linked to emotional distress (e.g., Dugas et al., 2004; Norton, Sexton, Walker, & Norton, 2005; Buhr & Dugas, 2002). From a cognitive perspective, pessimistic, inflexible

thinking, hopelessness, and rumination are implicated as key processes. Individuals high in IU may maintain pessimistic certainty about future events to protect from the uncertainty of not knowing what may come to be (Dupuy & Ladouceur, 2008). This stance predisposes individuals to a negative outlook. Such inflexible, pessimistic interpretations of life events may provoke despondency and hopelessness (Dupuy & Ladouceur, 2008). The hopelessness model of depression theorizes that depression occurs when an individual acquires a sense of certainty about being helpless, which subsequently transforms into hopelessness (Abramson, Metalsky, & Alloy, 1989). Thus, inflexibility in adhering to pessimistic certainty may provoke helplessness and hopelessness, which contribute to depressive symptoms. In other words, individuals are more likely to experience depressive symptoms like hopelessness as they steadfastly hold onto expectations of negative future outcomes.

Additionally, individuals who find uncertainty distressing may engage in ruminating about their uncertainty, contributing to the maintenance of depressive symptoms (Yook et al., 2010; Liao & Wei, 2011; McEvoy and Mahoney, 2011, 2012). Rumination involves perseverating on distress that leads to fixation on problems (Nolen-Hoeksema, Wisco, & Lyubomirsky, 2008). It is a cognitive process associated with a negatively skewed perspective on past, present, and future events (e.g., Lyubomirsky, Caldwell, & Nolen-Hoeksema, 1998; Lyubomirsky & Nolen-Hoeksema, 1995; Teasdale, 1983), negative attribution style (Robinson & Alloy, 2003), self-criticism, decreased problem solving and hopelessness (Lyubomirsky, Tucker, Caldwell, & Berg, 1999), all of which are likely contributors to depressive symptoms.

From a behavioral perspective, individuals highly intolerant of uncertainty may cope with the anxiety that uncertainty arouses through avoidance (Duronto, Nishida, & Nakayama, 2005; Sorrentino, Holmes, Hanna, & Sharp, 1995) Avoidance limits the scope of activities,

relationships and opportunities in which one can engage. Reductions in interpersonal interactions may result in isolation, loneliness, anhedonia, and other depressive symptoms (Kashdan, 2011). Ottenbreit and Dobson (2004) found cognitive and behavioral avoidance to be moderately, positively correlated with depressive symptoms. Additionally, a longitudinal study of the impact of stress and avoidance on development of depression found cognitive avoidance predicted depression symptoms three years later (Blalock & Joiner, 2000). Overall, avoidance and rumination both correlate in moderately positive manners with depressive symptoms (e.g., Dickson, Reilly, & Ciesla, 2011; Bjornsson, Carey, Hauser, Karris, Kaufman, et al., 2010; Watkins and Moulds, 2009).

### **Meaning in Life, Uncertainty, and Depression**

PM is a vital contributor to well-being and a robust protector against stressors that may trigger psychopathology. When an individual lacks the sense that his or her life is meaningful, he/she is at greater risk of experiencing depressive symptoms upon encountering a stressor. As many stressors in daily life involve or provoke some ambiguity, when such an “at-risk” individual encounters stressors, he/she is likely to experience intolerance of the uncertainty provoked and may have fewer intrapersonal and interpersonal resources from which to draw in confronting the stressful scenario. PM is a key intrapersonal resource that may equip the individual with a structure from which to make sense of the ambiguous.

SM might be representative of one way in which uncertainty and PM interact. SM, like uncertainty tolerance, varies across individuals such that SM might indicate an approach orientation to uncertainty for some, whereas for others SM may more likely be an expression of despair. For those individuals low in PM who desire meaning (high SM) and find uncertainty intolerable, the search for meaning and encounters with uncertainty-provoking stimuli may be

more likely to produce distress. On the other hand, individuals low in PM who desire meaning (high SM) and find uncertainty more tolerable may not respond with distress to experiences that produce uncertainty.

Thus, high PM may serve as a protective or buffering factor in this relationship. A strong sense of meaning may serve as an internal certainty resource that, when primed to confront uncertainty, will protect individuals from experiencing depressive symptoms. By utilizing their robust framework for understanding the world, those high in PM may build or maintain meaning in light of uncertain, potentially meaningless stimuli, even if they are highly intolerant of uncertainty. These individuals may also be less likely to experience depressive symptoms after an uncertainty-salient experience as their meaning remains intact and buffers against the negative consequences of uncertainty.

The present investigation consists of two studies. The first study examines how PM, individuals' dispositional responses to uncertainty, and depressive symptoms relate. The key hypotheses in this study purport that PM correlates negatively with intolerance of uncertainty and with depressive symptoms, whereas intolerance of uncertainty and depressive symptoms are hypothesized to correlate positively with each other. The second study utilizes an experimental paradigm to manipulate participants' experiences of uncertainty-provoking stimuli. The fundamental hypotheses of this study center around that idea that those who are lowest in PM and experience uncertainty as intolerable are most likely to report depressive symptoms, especially when they are exposed to the experimental condition that provokes existential uncertainty.

## **Hypotheses**

### *Study 1*

*Hypothesis 1:* Presence of meaning will negatively correlate with intolerance of uncertainty.

*Hypothesis 2:* Presence of meaning will positively correlate with tolerance for ambiguity.

*Hypothesis 3:* Presence of meaning will negatively correlate with personal need for structure.

*Hypothesis 4:* Presence of meaning will negatively correlate with depressive symptomology.

*Hypothesis 5:* Intolerance of uncertainty will positively correlate with depressive symptomology.

*Hypothesis 6:* Tolerance for ambiguity will negatively correlate with depressive symptomology.

*Hypothesis 7:* Personal need for structure will correlate positively with depressive symptomology.

### *Study 2*

*Hypothesis 1:* Individuals who receive the existential uncertainty salience prompt will score highest on depressive symptom measures.

*Hypothesis 2:* Individuals who receive the base uncertainty prompt will score between the “existential uncertainty salience prompt” group and the “control prompt” group on depressive symptom measures.

*Hypothesis 3:* Individuals who receive the control prompt will score lowest on depressive symptom measures.

*Hypothesis 4:* Meaning in life will moderate the effects of the experimental manipulation such that the highest scores on measures of depressive symptoms will be observed among those low in meaning who also receive the existential uncertainty prompt, followed by those in the uncertainty prompt condition, and then by those in the control condition.

*Hypothesis 5:* Dispositional response to uncertainty will moderate the effects of the experimental manipulation such that the highest scores on measures of depressive symptoms will be observed among those high in IU or PNS who also receive the existential uncertainty prompt, followed by those in the uncertainty prompt condition, and then by those in the control condition.

*Hypothesis 6:* This is an exploratory hypothesis that meaning will buffer the effects of *the existential uncertainty prompt* such that those high in IU or PNS will report fewer depressive symptoms at higher levels of meaning.

## CHAPTER 2: Method

The purpose of Study 1 was to assess how meaning in life, uncertainty, and depressive symptomology in a sample of undergraduate students relate. Multiple instruments measuring meaning in life, uncertainty and depressive symptoms were used in Study 1 to examine correlations and moderation models. Thus, Study 1 assessed whether any of the meaning and uncertainty measures interacted in a meaningful way to predict depressive symptoms and if instruments for each construct of interest measure identical or different constructs. The best fitting measures for each construct in the identified models were utilized in an experimental procedure. Study 2 employed an experimental design with an uncertainty-salience manipulation to deduce how differences in presence of meaning in life and intolerance of uncertainty influenced depressive symptoms in the context of uncertainty-provoking experimental manipulations. Specifically, Study 2 examined participants' reactions to abstract modern art after exposure to one of three uncertainty conditions. Measures of reactions to artwork and depressive symptoms were assessed after exposure. Comparisons of depressive symptoms post-manipulation were based upon within-person factors including meaning in life and intolerance of uncertainty and the between-person factor of exposure condition.

### Study 1

**Participants.** Participants included 490 undergraduate students seeking research course credit through the psychology department research pool at a large public university in the Rocky Mountain region. Participants ranged in age from 18-45 years ( $M= 19.14$ ,  $SD= 2.12$ ). The sample was largely female (78.6%) and Caucasian (82.7%) (see Table 1).

**Procedure.** Participants were recruited from undergraduate psychology courses in return for course credit. Participants in the study electronically signed an informed consent document

that described the study, outlined potential risks and benefits of participation, and assured confidentiality (See Appendix A). All participants completed a series of measures (see Appendix B), including a Demographic form, Meaning in Life Questionnaire (MLQ), Intolerance of Uncertainty Scale (IUS-27), Tolerance of Ambiguity Scale (TAS), Personal Need for Structure (PNS), Center for Epidemiologic Studies Depression Scale- Revised (CESD-R), Patient Health Questionnaire (PHQ-9), and the Depression Anxiety Stress Scales (DASS-21). Upon completion of these measures, participants received a web-delivered debriefing form describing the study's purpose and providing contact information for the investigators (See Appendix C). Participants' surveys were de-identified and all questionnaires were stored in a protected electronic folder. All procedures in this study were approved by the Colorado State University Human Subjects Committee and Institutional Review Board prior to implementation.

**Measures.** (see Appendix B)

**Demographic Form.** In Study 1, descriptive information about participants was gathered using a brief questionnaire. This form included items related to age, gender, race, ethnicity, religion, and education level.

**Meaning in Life Questionnaire (MLQ).** The Meaning in Life Questionnaire (Steger et al., 2006) is a 10-item self-report scale with two subscales measuring perceived presence and search for meaning in life. Participants answer each item on a Likert-type 7-point scale where 1 equates to "absolutely untrue" and 7 equates to "absolutely true". Items on the Presence subscale (1, 4, 5, 6 and 9-reverse-coded) assess the degree to which participants perceive life as meaningful (e.g., "I understand my life's meaning"). Items on the Search subscale (2, 3, 7, 8 and 10) assess the degree to which participants are searching for meaning in life (e.g., "I am

searching for meaning in my life”). Scores on each subscale range from 5-35; however, in the current study, scores on each scale from 5-25 due to modification of the Likert scale.

In college student samples, mean scores on the MLQ presence and search subscales are typically in the low to mid 20s (Duffy & Raque-Bogdan, 2010; Steger et al., 2006; Schulenberg, Strack, & Buchanan, 2011). Additionally, negative correlations between the Presence and Search subscales have been noted in college student populations in the United States, with correlations ranging from -.19 to -.30 (Schulenberg et al, 2011).

Internal consistency has been established for subscales of the MLQ. The Presence and Search subscales internal consistency measures range from .80 to .93 (Steger et al., 2006; Duffy & Raque-Bogdan, 2010; Park et al., 2010; Schulenberg et al, 2011; Steger & Kashdan, 2007; Steger et al., 2009; Whittington & Scher, 2010). Scores on both subscales of the MLQ are moderately stable over the course of 13 months and demonstrate strong one-month test-retest reliability (Steger et al., 2006; Steger & Kashdan, 2007).

The MLQ has good construct validity. Presence of meaning correlates positively with life satisfaction ( $r = .46$ ) and negatively with depression ( $r = -.48$ ) and neuroticism ( $r = -.23$ ) (Steger et al., 2006). Scores on the Search for Meaning subscale correlate positively with depression ( $r = .36$ ), sadness ( $r = .26$ ), and fear ( $r = .25$ ) (Steger et al., 2006). In addition, the MLQ corresponds closely to alternative measures of perceived meaning including the Purpose in Life test and the Life Regard Index (Schulenberg et al, 2011).

**Intolerance of Uncertainty Scale (IUS).** The Intolerance of Uncertainty Scale (IUS; French version: Freeston et al., 1994; English translation: Buhr & Dugas, 2002) is a 27-item questionnaire designed to assess respondents’ reactions to and beliefs about uncertainty. Items are measured on a five-point Likert scale, with 1 = “not at all characteristic of me” to 5 =

“entirely characteristic of me”. Examples of items include “Uncertainty makes me uneasy, anxious or stressed”, “Uncertainty keeps me from living a full life” and “One should always look ahead so as to avoid surprises”.

Buhr and Dugas (2002) translated the IUS from French to English and assessed the psychometric properties of the English version. Internal consistency is high ( $\alpha = .94$ ) and the measure demonstrates good test-retest reliability ( $r = .74$ ) after five weeks (Buhr & Dugas, 2002). Intolerance of uncertainty correlates with measures of worry ( $r = .60$ ), anxiety ( $r = .41$ ) and depression ( $r = .38$ ). Intolerance of uncertainty also correlates with interpreting ambiguous situations as threatening ( $r = .50$ ; Dugas et al., 2005). Dugas, Gosselin, and Ladouceur’s (2001) findings on the specificity of the intolerance of uncertainty to worry further support its psychometric strength.

There is discrepancy in the literature related to the underlying factor structure of the IUS. Freeston et al. (1994) suggested a five-factor solution in analyzing the principal components of the IUS-27, Buhr and Dugas (2002) identified a four-factor solution for the IUS-27, Norton (2005) a four or five-factor solution dependent upon the sample, and Carleton, Norton and Asmundson (2007) a two-factor solution alongside a 12-item scale to measure IUS (IUS-12). Birrell et al. (2011) conducted a factor analysis of the IUS and also supported a two-factor model consisting of 12 total items. In their study, factor 1 consists of items in the category of: “unacceptability and avoidance of uncertainty” (Freeston et al., 1994) and factor 2: “uncertainty leading to the inability to act” (Buhr & Dugas, 2002) (Birrell et al., 2011).

Based on the scope of this study and the goal of exploring all possible dimensions and underlying aspects of uncertainty, the IUS-27 was utilized. In samples of undergraduate students in the United States, mean scores on the IUS-27 range from 51.64 (Dugas, Gosselin, &

Ladouceur, 2001) to 57.46 (Dugas et al, 2005; Study 2). A large exploratory study conducted by Sexton and Dugas (2009) found a significant, yet small difference in mean scores between women and men (women:  $M=57.44$ ,  $SD= 19.09$ ; men:  $M=54.16$ ,  $SD=17.07$ ,  $d=0.18$ ). In their exploratory and confirmatory studies (Sexton & Dugas, 2009), the IUS had high internal consistency ( $\alpha = .95$  in both samples) and average inter-item correlations were  $r =.40$  and  $.39$ .

**Tolerance of Ambiguity Scale.** The Tolerance of Ambiguity Scale (Budner, 1962) is a 16-item measure with three subscales: novelty, complexity, and insolubility. These subscales are considered to measure sources of ambiguity tolerance and are rated on a scale of 1-7, where 1= strongly disagree and 7= strongly agree. Half of the items are reverse scored. Examples of items assessing tolerance of novelty ambiguity include: “I would like to live in a foreign country for a while”; “What we are used to is always preferable to what is unfamiliar” (reverse scored); “A person who leads an even, regular life in which few surprises or unexpected happenings arise really has a lot to be grateful for” (reverse scored). Examples of items that assess the complexity sources include: “A good job is one where what is to be done and how it is to be done are always clear” (reverse scored); “People who fit their lives to a schedule probably miss most of the job of living”; “It is more fun to tackle a complicated problem than to solve a simple one”. Items that target the insolubility component include: “An expert who doesn’t come up with a definite answer probably doesn’t know too much” (reverse scored); “There is really no such thing as a problem that can’t be solved”, and “Many of our most important decisions are based upon insufficient information” (Budner, 1962).

Furnham and Marks (2013) reviewed studies on tolerance of ambiguity (TA) and additional scales for measuring ambiguity tolerance. They indicate that Budner’s TA scale has poor internal consistency (Cronbach’s  $\alpha = .49$ ) yet high test-retest reliability ( $\alpha = .85$  over 2

months) (Furnham & Marks, 2013). According to Buhr and Dugas' (2006) work, Budner's TA scale correlates negatively with the IUS-27 and perceived mastery while correlating negatively with worry, perfectionism and perceived constraints. Budner's TA scale also correlates positively with mindfulness, willingness to try new things, and seeking novelty (Furnham & Marks, 2013).

Benjamin, Riggio, and Mayes (1996) investigated the reliability and factor structure of Budner's TA Scale with undergraduate students. Confirmatory factor analyses were unable to be replicated and internal reliability was low ( $\alpha = .44$ ), thus these authors concluded Budner's scale to be a poor measure of tolerance for ambiguity. However, this scale remains one of the best known and most widely used measures of tolerance for ambiguity (Furnham & Marks, 2013; Benjamin et al., 1996).

**Personal Need for Structure (PNS).** The Personal Need for Structure Scale (PNS; Thompson, Naccarato, Parker, & Moskowitz, 2001) is a 12-item measure of an individual's tolerance for the existence of uncertainty and desire for structured knowledge and certainty. Individuals high in personal need for structure are decisive and experience discomfort if they perceive a situation as lacking in structure and clarity (Thompson et al., 2001). Those high in personal need for structure may have rigid, inflexible cognitive styles, may find creative tasks and tasks that involve abstract or multiple solution generation challenging (Thompson et al., 2001). Individuals low in personal need for structure are less averse to unstructured or uncertain stimuli, and may seek ambiguity, novelty, and change (Vess, Routledge, Landau, & Arndt, 2009).

Examples of items on the PNS scale include, "I like a place for everything and everything in its place", "It upsets me to go into a situation without knowing what I can expect from it", "I

hate to be with people that are unpredictable”. Respondents rate their preferences on a 6-point scale (1= *strongly disagree* and 6= *strongly agree*). Responses on 4 items (#2, 5, 6, 11) are reverse scored and summed with the remaining items for a total score.

Psychometric analyses indicate the PNS scale is sufficiently reliable and empirically valid (Neuberg & Newsome, 1993; Thompson et al., 2001). Psychometric analysis of the 12-item PNS scale conducted by Thompson et al. (2001) resulted in a one-factor solution accounting for 37.8% of variance in PNS scores and a Cronbach’s alpha of .84.

Thompson et al. (2001) found a moderate positive correlation ( $r = .29$ ) between scores on the PNS scale and the Beck Depression Inventory (BDI). Vess et al. (2009) review findings that the PNS scale is associated in expected manners with constructs like need for cognitive closure, dogmatism, openness to experience and intolerance of ambiguity. The predictive validity of the PNS scale is supported by findings relating PNS to stereotyping (Neuberg & Newsom, 1993), to developing spontaneous assumptions based on traits (Moskowitz, 1993), and utilizing social judgments to make inform decisions (Ford & Kruglanski, 1995).

Scores on the PNS scale in college student samples range from  $M = 3.05$ ,  $SD = .57$  (Vess et al., 2009, Study 1a),  $M = 3.07$ ,  $SD = .73$  (Vess et al., 2009, Study 1d),  $M = 3.32$ ,  $SD = .67$  (Vess et al., 2009, Study 1c),  $M = 3.53$ ,  $SD = .61$  (Routledge, Juhl, & Vess, 2012),  $M = 3.60$ ,  $SD = .79$  (Vess et al., 2009, Study 1b).

**Center for Epidemiologic Studies Depression Scale- Revised (CESD-R).** The CESD-R (Eaton et al., 2004) is a revised form of the Center for Epidemiologic Studies Depression Scale (CES-D; Radloff, 1977) that reflects updated diagnostic criteria for DSM-IV major depressive episode and addresses psychometric limitations of the original scale (Van Dam & Earleywine, 2010). The CESD-R is a 20-item measure of depression symptomatology deemed to be a useful

tool for assessing depression in the general population (Van Dam & Earleywine, 2010). Participants rate experiencing of symptoms on a 4-point Likert scale where 0 represents “not at all or less than 1 day over the past week”, 1 represents “1-2 days over the past week”, 2 represents “3-4 days over the past week”, 3 represents “5-7 days over the past week”, and 4 represents “nearly every day for 2 weeks”. Examples of items include, “I felt sad”, “Nothing made me happy”, “I slept more than usual”, “I lost interest in my usual activities”, and “I could not focus on important things”.

Examination of psychometric properties in community and student samples indicates the CESD-R exhibits high internal consistency, strong factor loadings, and good convergent validity with anxiety and negative affect and divergent validity with positive affect (Van Dam & Earleywine, 2010). In a community sample of approximately 7,000 and a student sample of approximately 250, internal consistency was high (Cronbach's  $\alpha=0.92$ ). Factor analysis indicates a unidimensional structure with two primary symptom clusters: negative mood and functional impairment (Van Dam & Earleywine, 2010). Additionally, in Van Dam & Earleywine's (2010) studies, the proportion of participants classified as “depressed” based on CESD-R responses was 4.6%, which corresponded closely to the epidemiological estimate of depression in the population at the time (Hasin, Goodwin, Stinson, & Grant, 2005). Van Dam and Earleywine (2010) indicate the CESD-R maintains the sensitivity of the original CES-D while improving accuracy and efficiency in identifying depression.

Goebert et al. (2009) found a prevalence rate of depressive symptoms equal to 25% in a sample of 1343 United States medical students (cut-off  $>16$ ). In a sample of undergraduate students, the CES-D had high internal consistency,  $\alpha=.86$ , a mean score on the CES-D equal to

16.1 ( $SD = 8.9$ ), and 25.9% of the sample exceeded the cutoff score for mild depression (Steger & Kashdan, 2009).

**Patient Health Questionnaire (PHQ-9).** This self-report screening questionnaire is part of the PRIME-MD Patient Health Questionnaire (Spitzer et al., 1999) and assesses the nine main DSM-IV criteria for major depression (Kroenke, Spitzer, & Williams, 2001). The PHQ-9 consists of 9 items that participants rate on a scale of 0-3 over the previous two weeks where 0= not at all, 1=several days, 2=more than half the days, and 3= nearly every day (Kroenke et al., 2001; Spitzer et al., 1999; Kroenke & Spitzer, 2002).

Spitzer et al. (1999) conducted a validation study of the PHQ-9 among primary care patients, finding sensitivity for detecting major depression at 73% and specificity 98%. Kroenke and Spitzer (2002) summarized findings of validation studies conducted with 6,000 participants that support criterion and construct validity of the PHQ-9 as a diagnostic assessment for depression. The PHQ-9 has been further validated and correlates highly with depression diagnoses given by clinicians (Henkel et al., 2004; Kroenke et al., 2001; Lowe, 2004) and other depression assessments (Henkel et al., 2004; Kroenke et al., 2001).

Garlow et al.'s (2008) sampling of 729 undergraduate students resulted in a mean PHQ-9 score of 10.44 with a standard deviation of 5.7. In their participants, 16.5% reported no depression, 29.6% mild depression, 30.6% moderate depression, 16.6% moderately severe depression, and 6.6% severe depression (Garlow et al., 2008). Eisenberg, Gollust, Golberstein, and Hefner (2007) utilized the PHQ-9 in their investigation of prevalence of depression, suicidality, and anxiety among university students in the United States. The prevalence of major depression in undergraduates was 5.2% and in graduate students 4.1% while prevalence of other depression was 8.6% in undergraduates and 7.2% in graduate students (Eisenberg et al., 2007).

**Depression Anxiety Stress Scales (DASS-21).** The Depression Anxiety Stress Scales (DASS-21; Lovibond & Lovibond, 1995) includes a 7-item scale designed to measure depression symptoms over the previous week, specifically dysphoric mood symptoms, anhedonia, lack of interest or pleasure, and hopelessness (Norton, 2007). The depression subscale of the DASS contains items such as “I couldn’t seem to experience any positive feelings at all”, “I found it difficult to work up the initiative to do things”, “I felt sad and depressed”, “I felt I wasn't worth much as a person”. Respondents rate items from 0 (did not apply to me at all) to 3 (applied to me very much).

Analyses of the psychometric properties of the DASS-21 reveal high internal consistency for the total scale,  $\alpha=0.93$  (Henry & Crawford, 2005) and average-moderate internal consistency of the depression subscale,  $\alpha=0.88$  (Henry & Crawford, 2005) and  $\alpha=0.83$  (Norton, 2007). Other studies find the DASS–depression subscale has high internal consistency with  $\alpha= .92$  and  $.93$  (Mascaro & Rosen, 2008). In a non-clinical normative sample of British participants, confirmatory factor analysis supports the DASS-21 as a valid measure of depression, anxiety, stress, and, altogether, the subscales measure negative affect (Henry & Crawford, 2005). The depression subscale also correlates highly with the BDI (Norton, 2007), indicating good convergent validity, and the DASS-21 has adequate construct validity (Henry & Crawford, 2005).

In a non-clinical normative British sample, mean score on the DASS-21 depression subscale was 2.83,  $SD = 3.87$ ; mean score on the DASS-42 depression subscale equaled 5.55,  $SD = 7.48$ . In Mascaro and Rosen’s (2008) sample of undergraduate students, women’s mean score on the DASS-42 depression subscale was 5.26 while men’s mean score was 5.97.

## Study 2

Study 2 was an experiment intended to provide information about how people respond in terms of depressive symptoms to various uncertainty manipulations based upon their trait levels of meaning in life and intolerance of uncertainty. Participants were randomly assigned to one of three conditions that varied in how they stimulated uncertainty: Base Uncertainty, Existential Uncertainty, and Control conditions. Two within-person factors, meaning in life and intolerance of uncertainty, were hypothesized to influence the ways in which individuals responded to uncertainty-provoking stimuli and their resulting depressive symptomology. Those individuals with high PM and low intolerance of uncertainty were predicted to be the most “resilient” to uncertainty-salient manipulations, whereas those low in PM and highly intolerant of uncertainty were hypothesized to be most at risk of experiencing depressive symptoms after uncertainty was stimulated. Three levels of uncertainty-salience served as between-subjects factors. Two of these were drawn from Landau et al. (2006) and one, the existentially-oriented uncertainty paradigm, is unique to this study. Many of the procedures and stimuli implemented in Study 2 draw directly from Landau et al. (2006). Study 2 extends Landau et al. (2006) by adding an existential uncertainty prompt as well as by linking meaning in life and intolerance of uncertainty with depressive symptoms.

**Participants.** Participants included 298 undergraduate students seeking research course credit through the psychology department research pool at a large public university in the Rocky Mountain region. Participants’ ages ranged from 18 to 26 years old ( $M = 18.72$ ,  $SD = 1.10$ ). The sample was 81.9% female and 78.2% White. 7.4% of participants identified as Latino, 5.4% as Asian American, 5% as Black, 2.7% as other, .7% as Native American, and .7% as Hawaiian/Pacific Islander. In terms of religion, 51.7% identified as Christian, 13.1% Agnostic,

12.4% Atheist, 3.4% Jewish, 1.3% Buddhist, .3% Hindu, and 17.8% did not respond. Most participants endorsed being minimally religious (55.4%), 22.5% as somewhat religious, 15.4% as very religious, and 6.7% declined to respond (see Table 2). Study 1 participants were not eligible to participate in Study 2.

**Procedure.** Undergraduate students were recruited to participate in this study in return for ½ course credit. Participants in the study electronically signed an informed consent document that describes the study, outlines potential risks and benefits of participation, and assures confidentiality (See Appendix A). All participants completed an initial series of online questionnaires surveying meaning in life (MLQ), uncertainty (IUS-27 and PNS-12), and mood (PANAS). Questionnaires were selected based on scale analyses conducted in Study 1.

After completing these initial measures, participants read a short statement, “How people imagine themselves in certain situations can tell us a lot about their personality. We’d like you to imagine being in the situation described below. As you’re reading the description, try to picture vividly in your head the situation described” (Landau et al., 2006, Study 4, pp. 885). Then, participants were randomly assigned to one of three conditions that varied in terms of how they stimulated uncertainty: Base Uncertainty, Existential Uncertainty, and Control conditions.

One-third of participants were randomly assigned to the base uncertainty condition and received the following prompt: “Imagine being in a strange city where the people speak an unfamiliar language and the people and the place appear nonsensical. Now that you’ve imagined yourself in this situation, we’d like you to write in the space below how you might feel in this situation. What kinds of thoughts would go through your head? How would you feel? Do your best to describe how you would feel in this situation” (Landau et al., 2006, Study 4, pp. 886).

One-third of participants were randomly assigned to the existential uncertainty condition and received the following prompt: “Imagine being in a life where nothing makes sense anymore, your job doesn’t make sense, you don’t feel like you really know the people around you, and you no longer have any idea what you want to do with your life. Now that you’ve imagined yourself in this situation, we’d like you to write in the space below how you might feel in this situation. What kinds of thoughts would go through your head? How would you feel? Do your best to describe how you would feel in this situation.”

One-third of participants were randomly assigned to the control condition and received the following prompt: “Imagine being in a familiar city that seems like home and where everything about the people and the place makes sense. Participants then read the following instructions: ‘Now that you’ve imagined yourself in this situation, we’d like you to write in the space below how you might feel in this situation. What kinds of thoughts would go through your head? How would you feel? Do your best to describe how you would feel in this situation’” (Landau et al., 2006, Study 4, pp. 886).

Participants were given five minutes to type a response to the prompt they received and were required to write a response of 250 characters. Then, all participants completed a filler activity in the form of a word search. The word search task consisted of finding all words possible in a 2 minute time period (Landau et al., 2006, Studies 2 & 3).

After the word search task, all participants received the following prompt: “Please view the following paintings for the full amount of time they are displayed on your computer screen and respond to the follow-up questions”. The three paintings selected for inclusion in this study were used by Landau et al. (2006, Studies 1 & 4), and all three paintings activated feelings of chaos in participants primed with mortality salience and received poor ratings by those

participants high in personal need for structure. Based on the Landau et al. (2006, Study 2) protocol, paintings were randomized. Paintings are described in the measures section below.

After viewing each painting, participants responded to the following questions on a 7-point Likert scale (0=not at all, 6=Very much): “‘How much do you like this artwork?’; ‘How much does this particular piece appeal to you at a gut level?’, and ‘Relative to other art you’ve seen, how interested would you be in checking out more art like this?’” (Landau et al., 2006, pp. 886)

Participants then completed in a randomized order the Positive and Negative Affect Scale (PANAS), the DASS-21 and PHQ-9, and a set of demographic questions and neutral questions that served as filler items to reduce bias in responses (see Appendix B). At the end of this form, participants were asked, “To help us build studies in the future, please tell us what you think this study was about?” Upon completion of this question, they received a web-delivered debriefing form describing the study’s purpose and providing contact information for the primary investigator (See Appendix C). Participants’ surveys were de-identified and all questionnaires stored in a protected electronic folder. All procedures in this study were approved by the Colorado State University Human Subjects Committee and Institutional Review Board prior to implementation.

**Measures.** (see Appendix B) Measures were identified for use in Study 2 based on Study 1 results. The IUS-27 and PNS-12 were identified as the best scales for measuring uncertainty and the DASS-21 and PHQ-9 were selected for measuring depressive symptoms.

**The Positive and Negative Affect Schedule (PANAS).** The Positive and Negative Affect Schedule (PANAS; Watson, Clark, & Tellegen, 1988) is composed of two 10-item scales measuring positive and negative mood. Positive affect reflects a state of pleasure, enjoyment,

enthusiasm, energy and alertness, while negative affect represents subjective distress, including mood states like anger, fear, anxiety, and guilt (Watson et al., 1988). Participants rate the extent to which they experience each mood state in the given time frame, with a rating of 1= “very slightly or not at all”, 2= “a little”, 3= “moderately”, 4= “quite a bit”, or 5= “extremely”. The time instruction can be “in the moment”, “today”, “past few days”, “past few weeks”, “year”, or “general”.

In their normative college student sample provided the time instruction of affect “in the moment”, Watson et al. (1988) found an internal reliability  $\alpha = .89$  for the PANAS positive affect (PA) scale,  $\alpha = .85$  for the PANAS negative affect (NA) scale, and  $r = -.15$  for the intercorrelation of PA-NA. Psychometric analyses indicate that the PANAS is highly reliable in a non-clinical adult sample (Watson et al., 1988; Crawford & Henry, 2004) and demonstrates convergent and discriminant validity (Watson et al., 1988). The PANAS scale correlates in expected manners with various state anxiety and depression measures (Crawford et al., 2004). For example, the PANAS-NA correlates highly with the Hopkins Symptom Checklist (HSCL) and correlates in a positive manner with the Beck Depression Inventory (BDI) (Crawford et al., 2004).

Watson et al. (1988) indicate that when given within short-term timeframes, such as “in the moment” or “today”, the PANAS is sensitive to change. Results from within-subjects analyses suggest that the PANAS captures intra-individual fluctuations in mood. Overall, normative data on the PANAS indicates it is a valid, reliable and efficient measure of mood across demographic groups (Watson et al., 1988; Crawford et al., 2004).

**Final Survey Form.** The final questionnaire for Study 2 incorporated items from the selected depression inventories, demographic information, a mood question, and filler items. See Appendix B for items.

**Paintings.** The paintings selected included: Wassily Kandinsky's *Composition VI*, Jackson Pollack's *Guardians of the Secret* and Wyndham Lewis's *Workshop* (see Appendix B). All three paintings are considered modern art and were utilized by Landau et al. (2006, Studies 1 & 4) in studies measuring mortality salience and personal need for structure. The paintings were all found to activate feelings of chaos and disorder and received significantly poorer reviews by those participants primed with morality salience and those who had a high personal need for structure.

## CHAPTER 3: RESULTS

### Study 1

Prior to running correlational analyses to test Study 1 hypotheses, exploratory analyses were conducted to check for outliers, assess the normality of distributions, and analyze reliability and factor structures of the scales. Outliers were identified using boxplot figures and z-scores, which aid in the detection of extreme scores. Cases were identified as potentially problematic through boxplot graphs and were then investigated. Due to the non-normality of many measures, cases were not considered for removal until data transformation occurred. Then, 12 cases were removed due to z-scores of +/- 3 on measures of depressive symptoms.

Descriptive analyses were run for each instrument (see Table 3). The three measures assessing depressive symptoms were highly positively skewed and leptokurtic. To address these issues of normality, several transformations were attempted, including taking the inverse of the score, using the logarithmic value of the score, and taking the square root of the score (Osborne, 2002). Although none of the transformations worked to eliminate skewness or kurtosis entirely, the square root transformation was most effective in reducing skewness. The non-transformed PHQ-9 distribution had a skew = 1.48 (SE skew = .097), and the square root transformed PHQ-9 had a skew of .249 (SE skew = .097). The non-transformed PHQ-9 distribution had a kurtosis = 1.82 (SE kurtosis = .195), and the square root transformed PHQ-9 had a kurtosis of -.648 (SE kurtosis = .195). The non-transformed CESD-R had a skew = 1.57 (SE = .098), and the square root transformed CESD-R had a skew of .339 (SE = .098). The non-transformed CESD-R distribution had a kurtosis = 2.43 (SE kurtosis = .195), and the square root transformed CESD-R had a kurtosis of -.286 (SE kurtosis = .195). The non-transformed DASSdep had a skew = 1.64 (SE = .097), and the square root transformed DASSdep had a skew of .578 (SE = .097). The non-

transformed DASSdep distribution had a kurtosis = 2.07 (SE kurtosis = .195), and the square root transformed DASSdep had a kurtosis of -.759 (SE kurtosis = .195). The MLQ presence subscale was slightly negatively skewed and kurtotic (Skew= -.283, SE skew = .097; Kurtosis=-.425, SE kurtosis=.195). No transformations were applied. Additionally, several IUS and PNS factors exhibited skew and/or kurtosis. No transformations were applied.

Additionally, the internal consistency for each scale was assessed through Cronbach's alpha reliability calculations (see Table 3). All scales demonstrated adequate internal consistency (See Table 3) except for the Tolerance of Ambiguity Scale ( $\alpha = .57$ ). Thus, the TAS was removed from further analyses.

Exploratory factor analyses (EFA) were conducted on the remaining two uncertainty scales due to controversy in the literature regarding each scale's factor structure. EFA using maximum likelihood with a Promax rotation was conducted, retaining items that correlated at .60 or greater on a factor and less than .30 on any other factor. EFA for the IUS-27 resulted in a four-factor solution accounting for 53.08% of the total variance ( $\chi^2 (226) = 640.72$ ); Table 4). Factor 4 consisted of only two items, thus it was not used in correlational or moderation analyses. EFA was also conducted on the PNS resulting in a three-factor solution that accounted for 43.88% of the total variance ( $\chi^2 (33) = 121.84$ ); Table 6). Factor 3 consisted of only 1 item, thus it was not used in correlational or moderation analyses.

**Hypothesis 1.** Bivariate linear correlational analyses were run to analyze relations between presence of meaning and each factor of intolerance of uncertainty. The hypothesis that presence of meaning will negatively correlate with intolerance of uncertainty was supported with all three factors of IUS. Presence significantly, negatively correlated with IUS 1 ( $r = -.18, p < .001$ ), IUS 2 ( $r = -.32, p < .001$ ), and IUS 3 ( $r = -.29, p < .001$ ) (See Table 3).

**Hypothesis 2.** The hypothesis that presence of meaning will negatively correlate with tolerance for ambiguity was not tested due to the poor reliability of the TAS.

**Hypothesis 3.** Bivariate linear correlational analyses were run to analyze relations between presence of meaning and each factor of Personal Need for Structure (PNS). The hypothesis that presence of meaning will negatively correlate with PNS was supported in one PNS subscale. Presence significantly, negatively correlated with PNS 1 ( $r = -.15, p < .001$ ). However, the correlation between presence and PNS 2 was non-significant and slightly positive ( $r = .063, ns$ ) (See Table 3).

**Hypothesis 4.** Bivariate linear correlational analyses were run to analyze relations between presence of meaning and each scale measuring depressive symptoms. The hypothesis that presence of meaning will negatively correlate with depressive symptoms was supported in each scale. Presence significantly, negatively correlated with DASSdep ( $r = -.36, p < .001$ ), CESD-R ( $r = -.34, p < .001$ ), and PHQ9 ( $r = -.31, p < .001$ ) (See Table 3).

**Hypothesis 5.** Bivariate linear correlational analyses were run to analyze relations between each factor of the IUS and each scale measuring depressive symptoms. The hypothesis that intolerance of uncertainty will positively correlate with depressive symptomology was supported in all subscales of the IUS with each measure of depression. IUS1 correlated significantly and positively with the DASSdep ( $r = .26, p < .001$ ), CESD-R ( $r = .29, p < .001$ ), and PHQ9 ( $r = .25, p < .001$ ). IUS2 correlated significantly and positively with the DASSdep ( $r = .38, p < .001$ ), CESD-R ( $r = .39, p < .001$ ), and PHQ9 ( $r = .35, p < .001$ ). IUS3 correlated significantly and positively with the DASSdep ( $r = .33, p < .001$ ), CESD-R ( $r = .32, p < .001$ ), and PHQ9 ( $r = .29, p < .001$ ) (See Table 3).

**Hypothesis 6.** The hypothesis that depressive symptomology will negatively correlate with tolerance for ambiguity was not tested due to the poor reliability of the TAS.

**Hypothesis 7.** Bivariate linear correlational analyses were run to analyze relations between each factor of the PNS and each scale measuring depressive symptoms. The hypothesis that PNS will positively correlate with depressive symptomology was supported for PNS1 with each measure of depression. PNS1 correlated significantly and positively with the DASSdep ( $r = .14, p < .001$ ), CESD-R ( $r = .15, p < .001$ ), and PHQ9 ( $r = .13, p = .001$ ). This hypothesis did not hold up for PNS2. PNS2 correlated negatively and significantly with the DASSdep ( $r = -.083, p = .037$ ) and negatively at a non-significant level with CESD-R ( $r = -.048, ns$ ) and the PHQ-9 ( $r = -.056, ns$ ) (See Table 3). Moderation models of the interaction of MLQ-P scores with the factors of the IUS and PNS in predicting depression scores were tested. Baron and Kenney's (1986) methodology was applied to test interaction terms and Aiken and West's (1991) to decompose interactions. When skewness and kurtosis were corrected for using the square root transformation for each depression scale, none of the moderation analyses between PM, IUS factors and PNS factors were significant. However, prior to transforming depression scores, the results of the moderation analyses were significant such that PM moderated the relation between a single factor scale of the IUS-27 and DASSdep ( $\Delta r^2 = .011, \beta = -.107, p = .013$ ). Overall, the purpose of Study 1 analyses was to hone instrumentation for Study 2 while also testing novel hypotheses about the interactions of meaning and uncertainty-related constructs in understanding depressive symptoms.

## **Study 2**

Based on analyses conducted in Study 1, the MLQ presence, IUS, PNS, DASSdep, and PHQ-9 were included in Study 2. Additionally, the PANAS was utilized as a pre-post-

assessment of change in mood. Exploratory analyses were conducted first. Participants ( $n=18$ ) were eliminated if they spent less than 15 minutes on the survey as pilot testing indicated 25-30 minutes as necessary for completion of all survey components. Two cases were eliminated due to essay response completion that included random letters typed in the open response box. Eight cases were removed due to careless responding on the PHQ-9 and DASSdep. Meade and Craig (2012) described one form of careless responding as responding inconsistently to measures or items assessing highly similar constructs. Response pattern indices can be developed by the researcher based on the constructs measured. Based on the strong, positive correlation between the DASSdep and PHQ-9 ( $r = .65$ ), respondents were deemed “careless” if the correlation between their responses was negative and of a medium effect ( $r < -.30$ ) magnitude. Finally, 3 cases were removed due to z-scores greater than 3 on the DASSdep or PHQ-9. Thus, Study 2 included 298 participants ranging in age from 18-26 ( $M=18.72$ ,  $SD = 1.10$ ) (See Table 2 for demographics).

Internal consistency, inter-item correlations and descriptive analyses were run for each instrument (see Table 7). Responses on the PM scale ranged from 5-25 ( $M = 17.31$ ,  $SD = 4.27$ ,  $Skew=-.240$ ,  $SEskew = .141$ ,  $Kurtosis = -.313$ ,  $SEkurtosis = .281$ ). The distribution of scores on the MLQp were normal, thus no transformations were applied. The DASSdep ( $M = 4.15$ ,  $SD = 3.83$ ,  $Skew = .924$ ,  $SEskew=.141$ ,  $Kurtosis = .001$ ,  $SEkurtosis = .281$ ) and PHQ-9 ( $M = 8.14$ ,  $SD = 6.06$ ,  $Skew = .824$ ,  $SEskew = .141$ ,  $Kurtosis = .193$ ,  $SEkurtosis = .281$ ) both exhibited high positive skew. The square root transformations of the DASSdep and PHQ-9 reduced skewness and were used for all analyses (SqrtDASS:  $M = 1.73$ ,  $SD = 1.08$ ,  $skew = -.093$ ,  $SEskew = .141$ ,  $Kurtosis = -.831$ ,  $SEkurtosis = .281$ ; SqrtPHQ9:  $M = 2.59$ ,  $SD = 1.20$ ,  $Skew=-.328$ ,  $SEskew = .141$ ,  $Kurtosis = -.15$ ,  $SEkurtosis = .281$ ).

Positive affect prior to the experimental manipulation (PAtime1) was leptokurtic (M = 29.33, SD = 9.02, Skew = .012, SEskew = .141, Kurtosis = -.723, SEkurtosis = .281) as was positive affect after the experimental manipulation (PAtime2: M = 27.07, SD = 9.56, Skew = .168, SEskew = .141, Kurtosis = -.726, SEkurtosis = .281). Negative affect was highly positively skewed prior to the manipulation (NAtime1) (M = 19.14, SD = 7.10, Skew = .801, SEskew = .141, Kurtosis = .099, SEkurtosis = .281) and after the manipulation (NAtime2: M = 17.10, SD = 7.22, Skew = 1.226, SEskew = .141, Kurtosis = 1.02, SEkurtosis = .281). Change scores were calculated to capture the difference in both positive and negative affect after the manipulation. PAchange (M = -2.26, SD = 5.28, Skew = .049, SEskew = .141, Kurtosis = 3.17, SEkurtosis = .281). NAchange (M = -2.04, SD = 4.30, Skew = -.003, SEskew = .141, Kurtosis = 5.02, SEkurtosis = .281). Both NA and PA decreased, thus participants experienced less positive and less negative affect after the experimental manipulation (See Table 7).

Exploratory factor analyses (EFA) were conducted on the two uncertainty scales, IUS and PNS, due to controversy in the literature regarding each scale's factor structure and findings in Study 1 that differed from factors reported in the literature. EFA using maximum likelihood with a Promax rotation was conducted, retaining items that correlated at .60 or greater on a factor and less than .30 on any other factor. EFA for the IUS resulted in a 4-factor solution accounting for 55.71% of the total variance with item loadings differing significantly from Study 1 ( $\chi^2 = 554.38$ ,  $df=249$ ). Because the results of the EFA differed drastically from the results of the EFA conducted in Study 1, a single factor IUS scale was developed based on the overlap of items in studies 1 and 2 that loaded on factor 1 when forced to fit a one factor model. This IUS scale (M = 38.14, SD = 14.27, Skew = .48, SEskew = .141, Kurtosis = -.436, SEkurtosis = .281) demonstrated good reliability in Study 2 ( $\alpha = .95$ ) and was utilized for all analyses in Study 2 (See Table 5).

Factor analysis for the PNS resulted in an identical three-factor solution as Study 1, with the addition of 1 item on the third factor ( $\chi^2 = 70.94$ ,  $df = 33$ , 45.79% total variance; Table 6). Factor 1 (PNS1) had an eigenvalue of 3.72, accounted for 31.06% of the total variance and consisted of items 1 and 7 ( $M = 7.08$ ,  $SD = 2.28$ ,  $Skew = -.15$ ,  $SEskew = .141$ ,  $Kurtosis = -.56$ ,  $SEkurtosis = .282$ ). This factor seems to capture people's responses to a lack of structure ("Lack of structure"). Factor 2 (PNS2) had an eigenvalue of 1.03, accounted for 8.58% of the variance and included items 3 and 10 ( $M = 8.00$ ,  $SD = 2.08$ ,  $Skew = .326$ ,  $SEskew = .141$ ,  $Kurtosis = -.062$ ,  $SEkurtosis = .282$ ). This factor captures people's desire to establish structure in their lives ("Desire for structure"). Factor 3 (PNS3) had an eigenvalue of .74, accounted for 6.16% of the total variance, and included items 5r and 11r ( $M = 5.94$ ,  $SD = 2.14$ ,  $Skew = .339$ ,  $SEskew = .141$ ,  $Kurtosis = -.305$ ,  $SEkurtosis = .282$ ). Factor 3 seems to capture people's enjoyment of spontaneity ("Liking spontaneity"). A one-factor IUS and three-factor PNS were used, based on items that overlapped in EFAs from both Study 1 and 2 (see Table 5).

Prior to running ANCOVA analyses, bivariate correlations between all measures were conducted (Table 7). MLQ presence correlated significantly, negatively with the DASSdep ( $r = -.45$ ,  $p < .001$ ), PHQ-9 ( $r = -.36$ ,  $p < .001$ ), IUS ( $r = -.37$ ,  $p < .001$ ), PNS1 ( $r = -.22$ ,  $p < .001$ ), and approached significance with PNS3 ( $r = -.11$ ,  $p = .059$ ). Non-significant correlations were found between the MLQ and PNS2 ( $r = .080$ , ns), PAchange ( $r = -.031$ , ns), and NAchange ( $r = -.058$ , ns).

DASSdep correlated positively with every measure except presence of meaning and NAchange. As expected, the DASSdep and PHQ-9 correlated in a very strong, positive manner ( $r = .65$ ,  $p < .001$ ). The DASSdep also correlated in a strongly positive way with the IUS ( $r = .55$ ,  $p < .001$ ), PNS1 ( $r = .36$ ,  $p < .001$ ), and PNS 3 ( $r = .25$ ,  $p < .001$ ). The DASSdep correlated

positively in a weaker manner with PNS 2 ( $r = .25, p = .012$ ) and PAchange ( $r = .11, p = .060$ ). The DASSdep correlated in a slight negative way with NA change ( $r = -.012, ns$ ).

The PHQ-9 showed a similar pattern of correlations as the DASSdep, correlating most strongly with the IUS ( $r = .50, p < .001$ ), PNS1 ( $r = .26, p < .001$ ), and less strongly with PNS3 ( $r = .18, p = .002$ ), PNS2 ( $r = .11, p = .062$ ). Non-significant relations between the PHQ-9 and PAchange ( $r = .081$ ) and NAchange ( $r = -.026$ ) were found.

The IUS correlated strongly with all PNS factors, especially PNS1 ( $r = .54, p < .001$ ). Correlations with PNS2 ( $r = .29, p < .001$ ) and PNS3 ( $r = .37, p < .001$ ) were also significant and positive. Additionally, the PNS factors correlated with each other in significant, positive ways. PNS 1 correlated with PNS2 most strongly ( $r = .46, p < .001$ ) and with PNS3 ( $r = .36, p < .001$ ). PNS 2 and 3 also correlated in a significant, positive way ( $r = .30, p < .001$ ). See table 7 for all correlations.

Analysis of Covariance (ANCOVA) and Hierarchical Linear Regression were utilized to test Study 2 hypotheses. Prior to conducting ANCOVA analyses, it is necessary to ensure assumptions are met. The first assumption is independence of cases. This assumption is upheld as participants were assigned to only 1 condition or group. Homogeneity of variance refers to equal variances across all groups. This was tested by the Levene statistic. The Levene statistic was not significant, indicating the data did not violate the assumption of homogeneity of variance and thus the F-statistic is interpretable. Normality of errors assumes that the DV is distributed normally within each condition. Despite several transformations of the DASSdep and PHQ-9, the square root transformed DASS did not meet the normality of errors assumption, as the Kolmogorov-Smirnov and Shapiro-Wilk tests of normality were significant. The PHQ-9

approached significance on the Kolmogorov-Smirnov and was significant on the Shapiro-Wilk test of normality.

Despite the violation of the normality of errors assumptions, ANCOVA analyses were conducted. Depression measured by the DASSdep and PHQ-9 served as the continuous outcome variable. Between-person factors included MLQ presence scores and IUS and PNS scores. The fixed factor was the condition (Control, Base Uncertainty Salience, Existential Uncertainty Salience). Because of the violation of normality of errors assumption, hierarchical regression analyses (Aiken & West, 1991) were also conducted to test Study 2 hypotheses 4, 5, and 6, which predicted complex moderation models.

Gender (244 women, 50 men, 2 transgender, 2 did not identify) significantly predicted scores on the DASSdep [ $F(3, 298) = 2.67, p = .048$ ] and PHQ-9 [ $F(3, 298) = 4.313, p = .005$ ]. Female participants reported significantly more depressive symptoms than male participants, thus gender was entered as a covariate in each ANCOVA analysis where the DASSdep and PHQ-9 were outcome variables. Additionally, positive and negative affect at time 1 correlate significantly with time 2 positive and negative affect, thus time 1 scores were entered as covariates in each ANCOVA analysis in which change in affect was the outcome variable.

**Hypothesis 1.** The first hypothesis was tested using a one-way between subjects ANCOVA wherein the depression scores of participants assigned to the control condition ( $n=101$ ) were compared to depression scores of those assigned to the base uncertainty condition ( $n=96$ ) and participants assigned to the existential uncertainty condition ( $n=101$ ). When depression was measured with the DASSdep, between-subjects differences were not significant [ $F(2, 294) = .062, p = .94$ ]. When depression was measured with the PHQ-9, between-subjects differences were not significant [ $F(2, 294) = .36, p = .70$ ]. Change in positive affect was not

significant between groups [ $F(2, 294) = .46, p = .63$ ]. Change in negative affect was not significant between groups [ $F(2, 294) = .36, p = .70$ ]. Thus, the hypothesis that individuals who receive the existential uncertainty salience prompt will score highest on depressive symptom measures was not supported.

**Hypothesis 2.** As there were no significant differences between groups, the hypothesis that individuals who receive the base uncertainty prompt will score between the “existential uncertainty salience prompt” group and the “control prompt” group on depressive symptom measures was not supported.

**Hypothesis 3.** As there were no significant differences between groups, the hypothesis that individuals who receive the control prompt will score lowest on depressive symptom measures was not supported.

**Hypothesis 4.** Hypothesis 4 stated that presence of meaning would moderate the effects of the experimental manipulation such that the highest scores on measures of depressive symptoms are observed among those low in presence of meaning who receive the existential uncertainty prompt, followed by those in the base uncertainty prompt condition, and then by those in the control condition. This hypothesis was initially tested using ANCOVA where PM served as a predictor variable, DASSdep and PHQ9 were each tested as outcome variables, and condition served as the between-subjects variable. Participants were split into tertiles based on mean scores on the PM subscale, such that those low in meaning were grouped in the bottom tertile, those with average presence of meaning were in the middle tertile, and the 33% with the highest scores on presence of meaning were placed in the top tertile. Of those participants who reported low levels of meaning, 33 were assigned to the control condition, 30 to the base uncertainty condition, and 37 to the existential uncertainty condition. When depression was

measured with the DASSdep, differences between conditions on depression were not significant [ $F(2, 96) = 1.76, p = .18$ ]. When depression was measured with the PHQ-9, differences between conditions on depression were not significant [ $F(2, 96) = 1.45, p = .24$ ].

This hypothesis was also tested using hierarchical linear regression with the predictor variables entered in a stepwise manner to predict depression and affect outcomes. The first step included gender and affect at time 1 (when change in affect was the outcome variable). The second step included the predictor variables of condition (Control, Base Uncertainty, Existential Uncertainty) and PM. The third step included the interaction term (Condition x PM). Of all the outcomes tested (DASSdep, PHQ9, change in negative affect (NAchange), and change in positive affect (PAchange) and all of the condition comparisons (Control versus Base Uncertainty, Base Uncertainty versus Existential Uncertainty, and Control versus Existential Uncertainty), the only significant moderation model was with PAchange as the outcome (Table 8). PAchange significantly differed for people assigned to the control condition versus the existential condition based on their level of presence of meaning (PM). The result countered expectations in that participants who reported low PM reported no change in PA from the existential prompt; however, participants who reported low PM who were assigned to the control condition reported reduced PA after the manipulation. Participants with high PM reported no change in PA after the existential manipulation; however, participants with high PM who were assigned to the control condition reported increased PA after the manipulation.

Thus, hypothesis 4, that presence of meaning would moderate the effects of the experimental manipulation such that the highest scores on measures of depressive symptoms would be observed among those low in meaning who received the existential uncertainty prompt, followed by those in the uncertainty prompt condition, and then by those in the control condition

was not supported. The finding related to change in positive affect countered hypotheses as it was expected that those participants low in PM would report decreased positive affect after experiencing the existential uncertainty prompt, especially in comparison to those reporting low presence of meaning who received the control prompt.

**Hypothesis 5.** Hypothesis 5 proposed that dispositional response to uncertainty would moderate the effects of the experimental manipulation such that the highest scores on measures of depressive symptoms would be observed among those high in IUS or PNS who received the existential uncertainty prompt, followed by those in the base uncertainty prompt condition, and then by those in the control condition.

Overall, findings from ANCOVA analyses did not support this hypothesis with any of the uncertainty or outcome measures. Like PM scores, scores on the IUS and PNS1, PNS2, and PNS3 were split into tertiles for use in the ANCOVA analyses. The hypothesis was first tested with those individuals who scored highest (the top tertile) on PNS1. Of these, 42 were assigned to the control condition, 44 to the base uncertainty condition, and 51 to the existential uncertainty condition. With the DASSdep, differences between conditions were not significant [ $F(2, 133) = .25, p = .78$ ]. With the PHQ-9, differences between conditions were not significant [ $F(2, 133) = .42, p = .66$ ].

This hypothesis was next tested with those individuals who scored highest (the top tertile) on PNS2. Of these, 44 were assigned to the control condition, 35 to the base uncertainty condition, and 42 to the existential uncertainty condition. With the DASSdep, differences between conditions were not significant [ $F(2, 121) = .024, p = .97$ ]. With the PHQ-9, differences between conditions were not significant [ $F(2, 121) = .44, p = .65$ ].

The hypothesis was then tested with those individuals who scored highest (the top tertile) on PNS3. Of these, 36 were assigned to the control condition, 40 to the base uncertainty condition, and 36 to the existential uncertainty condition. With the DASSdep, differences between conditions were not significant [ $F(2, 112) = .77, p = .47$ ]. With the PHQ-9, differences between conditions were not significant [ $F(2, 112) = .48, p = .62$ ].

This hypothesis was finally tested with those individuals who scored highest (the top tertile) on the IUS. Of these, 35 were assigned to the control condition, 33 to the base uncertainty condition, and 32 to the existential uncertainty condition. With the DASSdep, differences between conditions were not significant [ $F(2, 100) = .12, p = .89$ ]. With the PHQ-9, differences between conditions were not significant [ $F(2, 100) = 2.01, p = .14$ ].

This hypothesis was also tested using hierarchical linear regression with the predictor variables entered in a stepwise manner to predict depression and affect outcomes. The first step included gender and affect at time 1 (when change in affect was the outcome variable). The second step included the predictor variables of condition (Control, Base Uncertainty, Existential Uncertainty) and IUS or PNS1. The third step included the interaction term (Condition x IUS or Condition x PNS1). Of all the outcomes tested (DASSdep, PHQ9, NAchange, and PAchange) and all of the condition comparisons (Control versus Base Uncertainty, Base Uncertainty versus Existential Uncertainty, and Control versus Existential Uncertainty), the only significant moderation models were with IUS as a predictor and outcome variables of PAchange and PHQ-9 scores.

PAchange significantly differed for people assigned to the control condition versus the existential condition based on their level of IUS (Table 9). The results aligned with expectations in that high-IUS participants assigned to the existential condition reported a slight decrease in PA

after the manipulation whereas High-IUS participants assigned to the control condition reported a slight increase in PA. Those low in IUS assigned to the control condition reported a decrease in PA, whereas those low in IUS assigned to the existential condition reported no change in PA. PHQ-9 scores significantly differed for people assigned to the control condition versus the base uncertainty condition based on their level of IUS (Table 10). Findings countered the hypothesis in that High-IUS participants assigned to the control condition reported more depressive symptoms than High-IUS participants assigned to the base uncertainty condition. The opposite pattern emerged for Low-IUS participants in that those assigned to the existential uncertainty condition reported more depressive symptoms than those assigned to the control condition.

**Hypothesis 6.** *Hypothesis 6:* This is an exploratory hypothesis that presence of meaning will buffer the effects of *the existential uncertainty prompt* such that those high in IUS or PNS will report fewer depressive symptoms at higher levels of meaning. This hypothesis was only tested using hierarchical linear regression.

Hierarchical linear regressions were first conducted to test the interaction between PM and IUS or PNS1 (PM x IUS and PM x PNS1) within the existential uncertainty condition on all outcomes (DASSdep, PHQ-9, PAchange, and NAchange). There were no significant moderation results within the existential condition. In other words, PM did not moderate relationships between IUS or PNS1 and any outcome within the existential uncertainty condition.

Hierarchical linear regressions were then conducted to test the effects of the three-way interaction (Condition x PM x IUS and Condition x PM x PNS1) on both measures of depression (DASSdep and PHQ-9) and change in affect (NAchange and PAchange) across conditions. The first step included gender and affect at time 1 (when change in affect was the outcome variable). The second step included the predictor variables of condition (Control, Base Uncertainty,

Existential Uncertainty), PM, and IUS or PNS1. The third step included the interaction term (Condition x PM x IUS or Condition x PM x PNS1). These analyses resulted in a total of six significant three-way interactions (see Figures 5-10).

First, there was a significant difference in scores on the DASSdep between participants assigned to the base uncertainty condition versus the existential uncertainty condition depending on their levels of IUS and PM. Overall, participants who reported high IUS and low PM reported the most depressive symptoms whereas low-IUS/High-PM participants in the base and existential uncertainty conditions reported the fewest depressive symptoms. High-IUS participants with high presence of meaning reported fewer depressive symptoms than their High-IUS/Low-PM peers in both conditions. In the existential condition, PM buffered more for high IUS participants; however, in the base uncertainty condition PM buffered more for low IUS participants (see Figure 5).

Second, there was a significant difference in scores on the PHQ-9 between participants assigned to the base uncertainty condition versus the existential uncertainty condition depending on their levels of IUS and PM. Participants assigned to the base uncertainty condition who reported high IUS and low PM reported the most depressive symptoms followed by High-IUS/Low PM participants assigned to the existential uncertainty condition. PM appeared to buffer against depressive symptoms for participants in all groups except for those participants with high IUS assigned to the base uncertainty condition (see Figure 6).

Third, there was a significant difference in change scores on negative affect between participants assigned to the control condition and the base uncertainty condition depending on their levels of IUS and PM. The pattern is complex (see Figure 7) as the directions of slopes vary across levels. It appears that PM has different effects across conditions and levels of IUS. Within

the base uncertainty condition, PM buffers against depressive symptoms in the base uncertainty condition for low-IUS participants whereas PM does the opposite among high-IUS participants (see Figure 7).

Fourth, there was a significant difference in scores on the PHQ-9 between participants assigned to the control condition versus the base uncertainty condition depending on their levels of PNS1 and PM. PM seemed to buffer the impact of PNS1 and condition across groups; however, it appeared to have the least impact on reducing reported depressive symptoms in participants who reported high levels of PNS1 who were assigned to the base uncertainty condition. This finding fits with hypotheses that although PM was protective for all (depressive symptoms across conditions and levels of PNS1 were lower when high PM was reported), those high in PNS1 assigned to a condition of uncertainty reported the highest levels of depressive symptoms (see Figure 8).

Fifth, there was a significant difference in change scores on positive affect between participants assigned to the control condition versus the existential uncertainty condition depending on their levels of PNS1 and PM. A positive score on PAchange indicates reporting more positive affect after the manipulation than prior to the manipulation. The pattern indicates that PA did not change for participants assigned to either group who reported high levels of PNS1 (see Figure 9). However, participants who reported low levels of PNS1 in the existential uncertainty condition reported more positive affect at low levels of PM than at high levels of PM. On the contrary, participants who reported low PNS1 and were assigned to the control condition reported more positive affect at high levels of PM (see Figure 9).

Sixth, there was a significant difference in change scores on negative affect between participants assigned to the base uncertainty condition versus the existential uncertainty

condition depending on their levels of PNS1 and PM. Presence of meaning appeared to have the greatest impact in reducing negative affect for low PNS1 participants assigned to the base uncertainty condition and high PNS1 participants assigned to the existential uncertainty condition in that high PM buffered the impact of the manipulation such that participants reported decreases in NA after the manipulation. Low-PNS1 participants in the base uncertainty condition reported increases in NA high levels of PM, and high-PNS1 participants in the base uncertainty condition reported minimal change in negative affect after the manipulation (see Figure 10).

Overall, the findings from these hierarchical regression analyses mostly align with Hypothesis 6. Generally, High-IUS/Low- PM participants reported the most depressive symptoms across conditions and, in some cases, PM buffered against high levels of IUS and the impact of exposure to uncertainty conditions such that participants across conditions and levels of IUS reported fewer depressive symptoms if they reported high PM.

**Ratings of paintings.** Participants' responses to paintings indicated that the paintings were viewed as undesirable, and that there was not a significant difference in perception of any of the paintings based on intolerance of uncertainty. Participants low in PNS2 perceived the Pollack painting as more desirable than those high in PNS2 [ $F(2, 294) = 6.71, p = .001$ ]. Participants low in PNS3 perceived the Pollack painting as more desirable than those high in PNS2 [ $F(2, 294) = 8.82, p < .001$ ]. In addition, participants low in PNS3 perceived the Kandinsky painting as significantly more attractive than those high in PNS3 [ $F(2, 294) = 3.23, p = .041$ ]. In general, people liked the Kandinsky painting the most ( $M= 3.35$ ), then the Lewis ( $M=3.02$ ), then the Pollack ( $M=2.82$ ). The only painting that elicited between condition differences approaching significance was the Pollack,  $F(2, 295) = 2.55, p = .080$ . Bonferroni

post-hoc analysis indicated that the control group liked the Pollack less than both uncertainty conditions.

**Summary.** Overall, most of the hypotheses for study 1 were supported, and several of hypotheses for study 2 were supported when analyzed using hierarchical regression. The only hypotheses not supported in study 1 involved factor 2 of the PNS. It did not correlate as expected with PM, DASSdep, CESD-R, or the PHQ-9. Results of study 2 supported some of the predictions made. Overall, Study 2 hypotheses 1-3 predicted between condition differences in scores on measures of depression and change in affect and were not supported. There were no significant differences on any measure of depression or change in affect between participants assigned to the control, base uncertainty, or existential uncertainty condition. Analyses to test hypothesis 4, that presence of meaning would moderate the impact of the experimental manipulation on outcome measures, did not support the hypothesis. Hierarchical linear regression resulted in one significant finding that presence of meaning moderated the relationship between the condition and change in positive affect for participants assigned to the control group and the existential uncertainty group. However, responding to the control prompt resulted in a greater reduction in positive affect for participants who reported low meaning in life than responding to the existential uncertainty prompt. This finding was contrary to the hypothesis that participants with low PM would be most detrimentally impacted by the existential prompt.

It was predicted in Hypothesis 5 that dispositional response to uncertainty (IUS or PNS1) would moderate the impact of the experimental manipulation on outcome measures such that participants with high IUS or PNS1 assigned to the existential uncertainty condition would report the most depressive symptoms. ANCOVA analyses resulted in no significant findings; however, hierarchical linear regression analyses resulted in two significant models with IUS as the

moderator and PAchange and PHQ-9 scores as the outcomes. The results aligned with expectations in that high IUS participants reported a decrease in PA if they were assigned to the existential condition, whereas High-IUS participants assigned to the control condition reported a slight increase in PA. On the other hand, results of the significant moderation model with PHQ-9 scores as the outcome countered Hypothesis 5. High-IUS participants assigned to the control condition reported more depressive symptoms than High-IUS participants assigned to the base uncertainty condition and Low-IUS participants assigned to the existential uncertainty condition reported more depressive symptoms than Low-IUS participants assigned to the control condition.

Hypothesis 6 denoted the prediction that there would be a three-way interaction between condition, PM, and IUS or PNS1, such that PM would buffer the impact of a condition, specifically the existential uncertainty condition, for individuals high in IUS or PNS1 such that they would report fewer depressive symptoms if they reported high levels of PM. Overall, the findings from these hierarchical regression analyses mostly align with Hypothesis 6. Generally, High-IUS/Low-PM participants reported the most depressive symptoms across conditions and PM buffered high levels of IUS and the impact of exposure to uncertainty conditions such that participants across conditions and levels of IUS reported fewer depressive symptoms if they reported high PM.

## CHAPTER 4: Discussion

The main purpose of this research was to assess how people's sense that their lives are meaningful and how well they tolerate uncertainty relate to symptoms of depression. Study 1 established relations between these constructs of interest. Although PM related in a significant negative manner with measures of depressive symptoms and intolerance of uncertainty, analyses did not support the hypothesis that presence of meaning in life moderates or buffers the relationship between intolerance of uncertainty and depressive symptoms. Small effects were detected between PM and measures of depressive symptoms ( $r^2$  ranged from .10 - .13) and between PM and IUS ( $r^2$  ranged from .03 - .08). Small effects were also found between IUS and various measures of depression ( $r^2$  ranged from .06 - .15). However, no significant moderation effect was found.

Beyond examining relations between PM, intolerance of uncertainty, and depressive symptoms, Study 2 experimentally manipulated uncertainty to assess for differences between groups where uncertainty was stimulated to varying degrees. Hypotheses related to the main effect of condition in Study 2 were not supported. For example, the prediction that participants who were randomly assigned to respond to a writing prompt aimed at eliciting existential uncertainty would report the highest levels of depressive symptoms in comparison to participants who received a base uncertainty prompt and a control prompt was not supported. One main limitation here was that no manipulation check was employed to assess for the level of uncertainty elicited by the prompts. Thus, it may be that the prompts did not elicit uncertainty as expected, thus contributing to null findings.

Another explanation for these null findings comes from recent research into mental simulation and meaning. Waytz, Hershfeld, and Tamir (2015) found that when individuals are

asked to engage in temporal or spatial forms of mental simulation, such simulation enhances their sense of meaning in life. The prompts utilized to provoke uncertainty in Study 2 required participants to engage in mental simulation such that they imagined themselves in certain scenarios. Thus, those participants assigned to the uncertainty conditions may have invoked their meaning-making systems to construct responses to the prompts, effectively enhancing their sense of meaning in life. This process might have engaged a buffering system that reduced the potentially negative effects of uncertainty on mood for those in the uncertainty conditions. Individuals high in IUS or PNS might be especially likely to engage in mental simulation in response to uncertainty because they tend to have a need for cognitive closure (Rosen et al., 2014). People who need cognitive closure engage cognitive resources to reduce uncertainty. Mental simulation may be one process through which those who need cognitive closure can engage cognitive resources by invoking their meaning-making system to develop a response to the uncertainty prompts. Even those individuals highly intolerant of uncertainty who report low levels of meaning in life may engage in meaning-making processes in an effort to buffer against the discomfort of experiencing uncertainty.

Findings from related research on terror management suggest that under neutral conditions, people experiencing depression demonstrate minimal worldview defense; however, when their worldview is threatened in some way (e.g., by provoking uncertainty), they more actively defend their worldview (e.g., a form of meaning making) than their non-depressed peers (e.g., Ann, 1995; Maxfield et al., 2014; Major et al., 2016). When meaning-making systems are engaged and are able to protect against the threat of mortality salience, or in this case, uncertainty salience, research indicates that depressive symptoms may be relieved (Major et al., 2016; Lemke, 2015). This seems to support the findings in many of the ANOVA analyses, albeit

non-significant, that participants high in IUS or PNS with low levels of PM assigned to the control group reported the most depressive symptoms. They were not required to engage in meaning-making, and thus meaning could not buffer against the negative effect of IUS on depressive symptoms.

Additionally, recent research on the structure of the IUS scale (Oglesby et al., 2017) indicates that those classified as “high IUS” were significantly more likely to be diagnosed with a depressive disorder than those classified as “moderate IUS” or “low IUS”. Thus, it may be that only very high levels of intolerance of uncertainty convey risk for developing a depressive disorder.

Therefore, contrary to the hypothesis that those low in meaning who receive the existential prompt would be most likely to experience more depressive symptoms, findings on mental simulation and terror management suggest that they might be least likely to experience depressive symptoms due to the activation of meaning-making processes. PM and IU/PNS did not operate as expected in predicting depressive symptoms by condition perhaps because the uncertainty prompt activated a meaning-making process, leading to cognitive closure that effectively reduced uncertainty.

Further support for this interpretation comes from findings related to hierarchical regression analyses testing the three way interaction between condition, PM, and dispositional response to uncertainty as findings indicate PM as protective under certain conditions. Based on the results, it appears that PM is most protective for people very high in IUS who were instructed to ponder their own existential crises. Interestingly, the results suggest that PM is also protective for people who are very low in IUS when they are instructed to consider a situation like being lost in a strange country. Thus, it could be that different orientations to tolerating uncertainty and

different types and degrees of uncertainty interact with presence of meaning in unique ways in influencing resulting depressive or affect symptoms.

Participants' ratings of the paintings showed similar, unique patterns based on condition, dispositional response to uncertainty, and PM. Paintings were hypothesized to serve as ambiguous stimuli provoking negative affective responses from those in the uncertainty conditions. Ratings of paintings were expected to supplement information about the effectiveness of the experimental manipulation. Just as the results of the experimental manipulation did not correspond with hypotheses, the paintings were not rated as expected. In general, the paintings were rated similarly between conditions. The only between-condition difference that approached significance was that participants in the control condition reported liking the Pollack painting less than those in both uncertainty conditions. The paintings were perceived by those with high need for personal structure as less desirable than those with low need for personal structure, so they were seen as ambiguous and disliked by those who dislike ambiguity. However, exposing someone to uncertainty prior to viewing these paintings did not provoke the expected response. This supports an alternative hypothesis that those in the uncertainty conditions made meaning when uncertainty was elicited and were thus less fazed by the ambiguous nature of the paintings than expected.

Although there are logical theoretical explanations for these findings, there may also be practical reasons the hypotheses were not supported. First, the scales assessing IUS and PNS exhibited unstable factor structures, explained less than ideal amounts of variance, and may not have captured the full construct of interest. Second, both measures of depressive symptoms resulted in highly non-normal distributions that required the data to be transformed. Transformation did not fully resolve issues of non-normality. In the case of ANOVA analyses,

the normality assumption was not met. Third, the experimental method was altered in that a novel uncertainty-provoking stimulus was piloted in this study. This addition may have upset the delicate balance achieved by other labs who have used the control and base uncertainty prompts in previous studies (e.g., Landau et al., 2006). These findings might suggest that greater care needs to be taken in stimulating experiences of uncertainty, but also that these effects may be somewhat fragile and difficult to produce.

In addition to these measurement limitations, both samples were composed of a disproportionate number of Caucasian (Study 1: 82.7%; Study 2: 78.2%) and female (Study 1: 78.6%; Study 2: 81.9%) participants, limiting the generalizability of results to all populations. Overall, it would be desirable to replicate this study with a larger, less homogenous sample using prompts that provoke uncertainty in the moment (without engaging mental simulation), employing a manipulation check, utilizing different measures to accurately capture the construct of intolerance of uncertainty, and perhaps to use data only from participants who report some depressive symptoms so as to reduce issues with data transformation and non-normality.

### **Implications**

Despite these limitations, the results of these studies provide useful information about how meaning in life, intolerance of uncertainty, and depressive symptoms relate. Results from Study 1 demonstrate the importance of considering the role intolerance of uncertainty may play in the development and maintenance of depressive symptoms.

Although the results of Study 2 countered hypotheses, the results may contribute valuably to clinical knowledge. If engaging individuals highly intolerant of uncertainty who lack a strong sense of meaning in life in mental simulation encourages meaning-making, this may protect them from developing depressive symptoms or may help relieve existing depressive symptoms. This

finding aligns with the philosophies of existential psychotherapy and narrative therapy. Providing therapeutic opportunities for individuals to engage in meaning-making, or construct narratives about their lives that feel meaningful, may enable them to more effectively cope with stressors that provoke feelings of uncertainty.

### **Future directions**

Based on the findings of these studies, it is important to re-conduct study 2 with a manipulation check and with variations in the prompts manipulating uncertainty. In light of Waytz et al.'s (2015) findings, varying the temporal nature of the prompts is necessary, as it is important to examine if people are more likely to make meaning when they are prompted with past or future-oriented consideration of uncertainty in comparison to present-oriented consideration. Thus, inducing uncertainty in the moment in comparison to prompting recollections of uncertain times or consideration of future ambiguities may clarify the interaction between experiencing uncertainty and engaging the protective influence of PM.

Additionally, to study the interaction between PM and uncertainty, it may be necessary to examine alternative modes of inducing uncertainty. One potential mechanism for inducing uncertainty is through film scenes that provoke feelings of suspense and/or uncertainty. If people who find uncertainty intolerable and report low PM view uncertainty-provoking film clips and report more symptoms of depression than their counterparts, results could provide insight into how such individuals experience uncertainty-laden daily events or ambiguous stimuli. An intriguing future step may involve examining how such individuals (low PM and high IUS) rate and respond to ambiguous facial expressions. If they rate such faces more negatively than their low-IUS counterparts, such findings might have implications in explaining the interpersonal connectedness mechanism through which depression develops. Specifically, if low PM/high IUS

individuals rate ambiguous faces more negatively than high PM/low IUS individuals, they may be more likely in their daily lives to avoid individuals that do not provide them with clear or easily interpretable reactions. They may also be prone to interpreting ambiguous reactions as a negative reaction to themselves, perhaps contributing to negative beliefs about the self, others, and the world, all of which contribute to the development of depression.

Overall, these two studies contribute to understanding the complex relation between PM, IUS/PNS, and depressive symptoms. Research on meaning in life and intolerance of uncertainty is rapidly growing, thus integrating new findings such as Waytz et al.'s (2015) research on the temporal impact on meaning and Oglesby et al.'s (2017) findings on the structure of IUS and its relation to depression is key in further developing a line of research focused on the interaction between people's sense of meaning in life, how they tolerate uncertainty, and the ways such variables interact to impact well-being, affect, and symptoms of psychopathology.

## TABLES

Table 1.  
*Study 1 Demographic information*

	<i>n</i>	%
Sex		
Female	385	78.6
Male	105	21.4
Race		
American Indian or Alaskan Native	5	1.0
Asian	31	6.3
Black or African American	11	2.2
Native Hawaiian or Pacific Islander	2	0.4
White	405	82.7
Do not wish to respond	28	5.7
Ethnicity		
Hispanic or Latino	68	13.9
Not Hispanic or Latino	394	80.4
Do not wish to respond	16	3.3

Table 2.  
*Study 2 Demographic information*

	<i>n</i>	%
<b>Sex</b>		
Female	244	81.9
Male	50	16.8
Transgender	2	.7
Other	2	.7
<b>Race and Ethnicity</b>		
Asian	16	5.4
Hispanic or Latino	22	7.4
Black or African American	15	5.0
Native American	2	.7
Hawaiian/PI	2	.7
White	233	78.2
Other	8	2.7

Table 3.  
*Study 1 Variable Means, Standard Deviations, Reliabilities, and Intercorrelations*

Measure	1	2	3	4	5	6	7	8	9
1. PM		-.18**	-.32**	-.29**	-.15**	.063	-.36**	-.34**	-.31**
2. IUS-1			.73**	.62**	.48**	.20**	.26**	.25**	.29**
3. IUS-2				.60**	.48**	.19**	.38**	.35**	.39**
4. IUS-3					.55**	.43**	.33**	.29**	.32**
5. PNS-1						.51**	.14**	.13**	.15**
6. PNS-2							-.083*	-.056	-.048
7. DASS								.73**	.80**
8. PHQ-9									.74**
9. CESD-R									
Mean	14.77	7.92	6.69	8.67	7.05	8.29	1.14	1.85	3.09
(SD)	(4.46)	(3.58)	(2.94)	(3.12)	(2.00)	(2.00)	(1.13)	(1.35)	(1.88)
Cronbach's $\alpha$	.90	.85	.83	.87	.70	.71	.87	.91	.94

\*\*  $p < .001$ ,

\*  $p < .05$

Table 4.  
*EFA results for IUS-27 Study 1*

Item loadings for 3-factor model		Study 1 (n= 481)
<b>Factor 1</b>	Eigenvalue	11.20
<i>Item 14</i>		.84
<i>Item 12</i>		.72
<i>Item 15</i>		.67
<i>Item 13</i>		.65
<b>Factor 2</b>	Eigenvalue	1.06
<i>Item 23</i>		.83
<i>Item 27</i>		.59
<i>Item 26</i>		.58
<b>Factor 3</b>	Eigenvalue	.79
<i>Item 6</i>		.91
<i>Item 5</i>		.59
<i>Item 8</i>		.57
X <sup>2</sup> square		640.72
df		226
Variance explained		53.08%

Table 5.  
*EFA results for IUS forced 1-factor model*

Item loadings for 1-factor model		Study 1 (n= 481)	Study 2 (n= 298)
<b>Factor 1</b>	Eigenvalues	11.10	12.42
<i>Item 15</i>		.79	.79
<i>Item 17</i>		.77	.76
<i>Item 14</i>		.77	.75
<i>Item 13</i>		.76	.75
<i>Item 12</i>		.76	.73
<i>Item 25</i>		.74	.79
<i>Item 9</i>		.72	.78
<i>Item 22</i>		.71	.69
<i>Item 26</i>		.71	.78
<i>Item 7</i>		.70	.75
<i>Item 5</i>		.69	.68
<i>Item 6</i>		.69	.68
<i>Item 27</i>		.68	.73
<i>Item 24</i>		.67	.74
<i>Item 20</i>		.64	.65
<i>Item 19</i>		.63	.73
<i>Item 23</i>		.62	.59
<i>Item 11</i>		.61	.67
<i>Item 16</i>		.60	.63
X <sup>2</sup> square		1631.29	1151.69
df		324	324
Variance explained		41.12%	46.01%

Table 6.  
*EFA results for PNS-12 Study 1 and Study 2*

Item loadings for 3-factor model		Study 1 (n= 481)	Study 2 (n=297 )
<b>Factor 1</b>	Eigenvalues	3.55	3.72
<i>Item 7</i>		.90	.92
<i>Item 1</i>		.62	.64
<b>Factor 2</b>	Eigenvalues	.82	1.03
<i>Item 4</i>		.73	.63
<i>Item 3</i>		.70	.74
<b>Factor 3</b>	Eigenvalues	.86	.74
<i>Item 5</i>		.79	.81
<i>Item 11</i>		.42	.72
X <sup>2</sup> square		121.84	70.94
df		33	33
Variance explained		43.88%	45.79%

Table 7.  
*Study 2 Variable Means, Standard Deviations, Reliabilities, and Intercorrelations*

Measure	1	2	3	4	5	6	7	8	9
1. PM		-.37**	-.22**	.080	-.11	-.45**	-.36**	-.031	-.058
2. IUS			.54**	.29**	.37**	.55**	.50**	.083	-.045
3. PNS1				.46**	.36**	.36**	.26**	-.003	-.16**
4. PNS2					.30**	.15*	.11	-.011	-.15*
5. PNS3						.25**	.18*	.087	-.028
6. DASS							.65**	.11	-.012
7. PHQ9								.029	-.060
8. ΔPA									.089
9. ΔNA									
Mean	17.31	38.14	7.08	8.00	5.94	1.73	2.59	-2.26	-2.04
(SD)	(4.27)	(14.27)	(2.28)	(2.08)	(2.14)	(1.08)	(1.20)	(5.28)	(4.30)
Cronbach $\alpha$	.88	.95	.73	.70	.73	.90	.89	.91	.87

\*\*  $p < .001$ ,

\*  $p < .05$

Table 8. *Multiple regression analysis to determine whether presence of meaning in life moderates the relationship between condition and change in positive affect.*

	<i>B</i>	<i>SE(B)</i>	<i>t</i>	<i>p</i>
Condition	-0.002	0.074	-0.031	0.98
Presence of Meaning (PM)	0.089	0.081	1.09	0.28
Condition x PM	-0.16	0.079	-2.08	0.039

Table 9. *Multiple regression analysis to determine whether intolerance of uncertainty moderates the relationship between condition and change in positive affect.*

	<i>B</i>	<i>SE(B)</i>	<i>t</i>	<i>p</i>
Condition	-0.067	0.077	-0.87	0.39
Intolerance of Uncertainty (IUS)	0.035	0.077	0.46	0.65
Condition x IUS	-0.19	0.078	-2.41	0.017

Table 10. *Multiple regression analysis to determine whether intolerance of uncertainty moderates the relationship between condition and PHQ-9 scores.*

	<i>B</i>	<i>SE(B)</i>	<i>t</i>	<i>p</i>
Condition	0.064	0.065	0.99	0.32
Intolerance of Uncertainty (IUS)	0.38	0.066	5.77	<.001
Condition x IUS	-0.13	0.067	-1.93	0.05

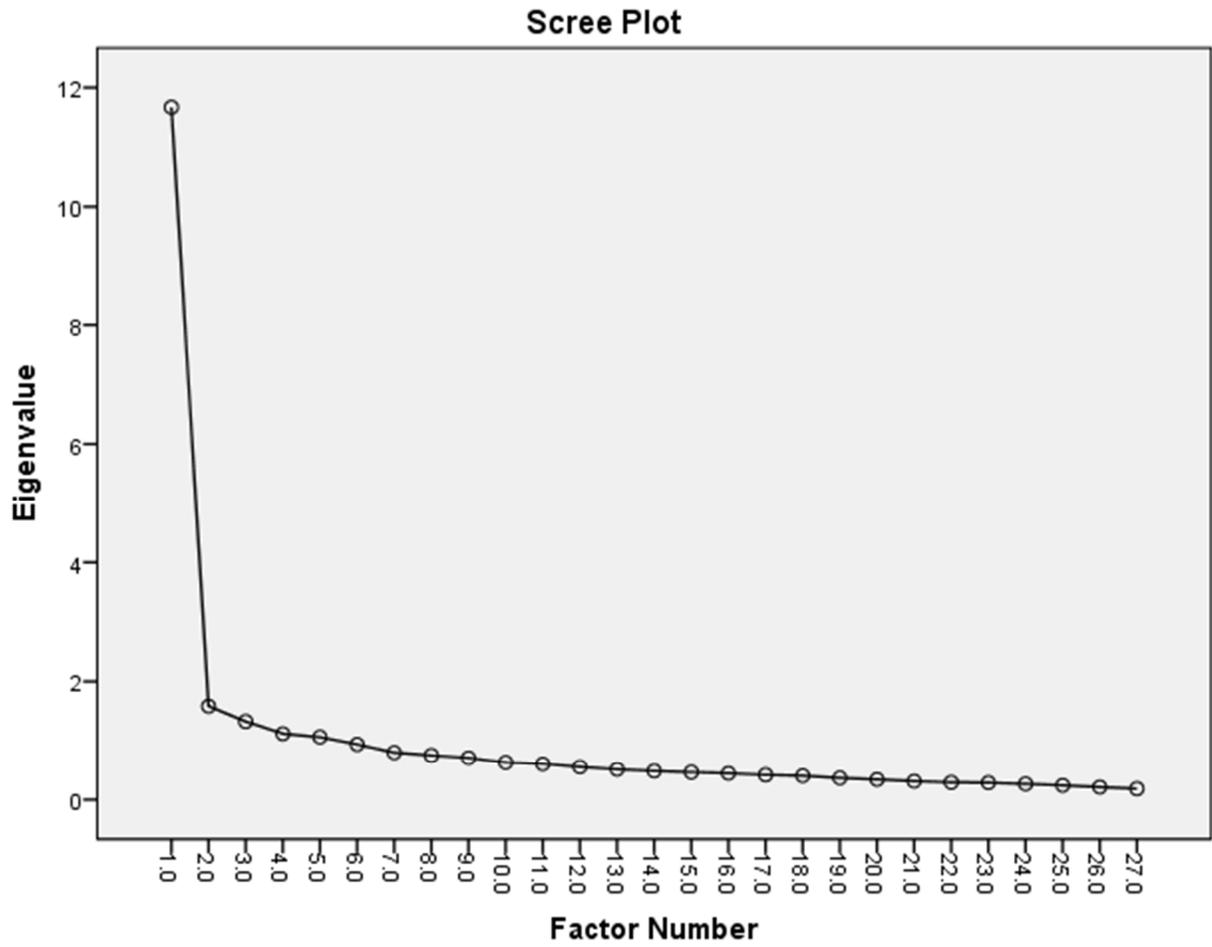


Figure 1. *Scree plot for IUS-27 Study 1 Exploratory Factor Analysis.*

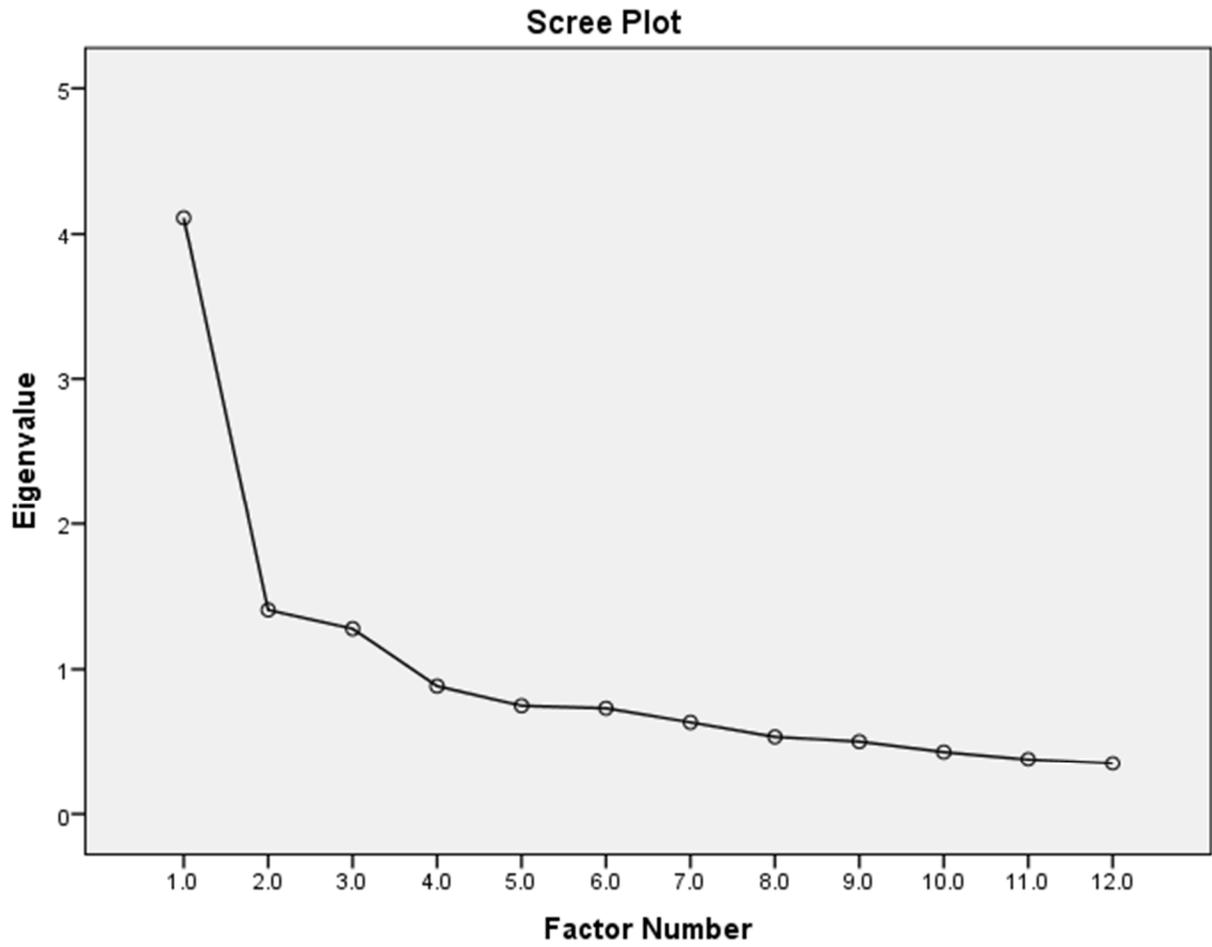


Figure 2. *Scree plot for PNS-12 Study 1 Exploratory Factor Analysis*

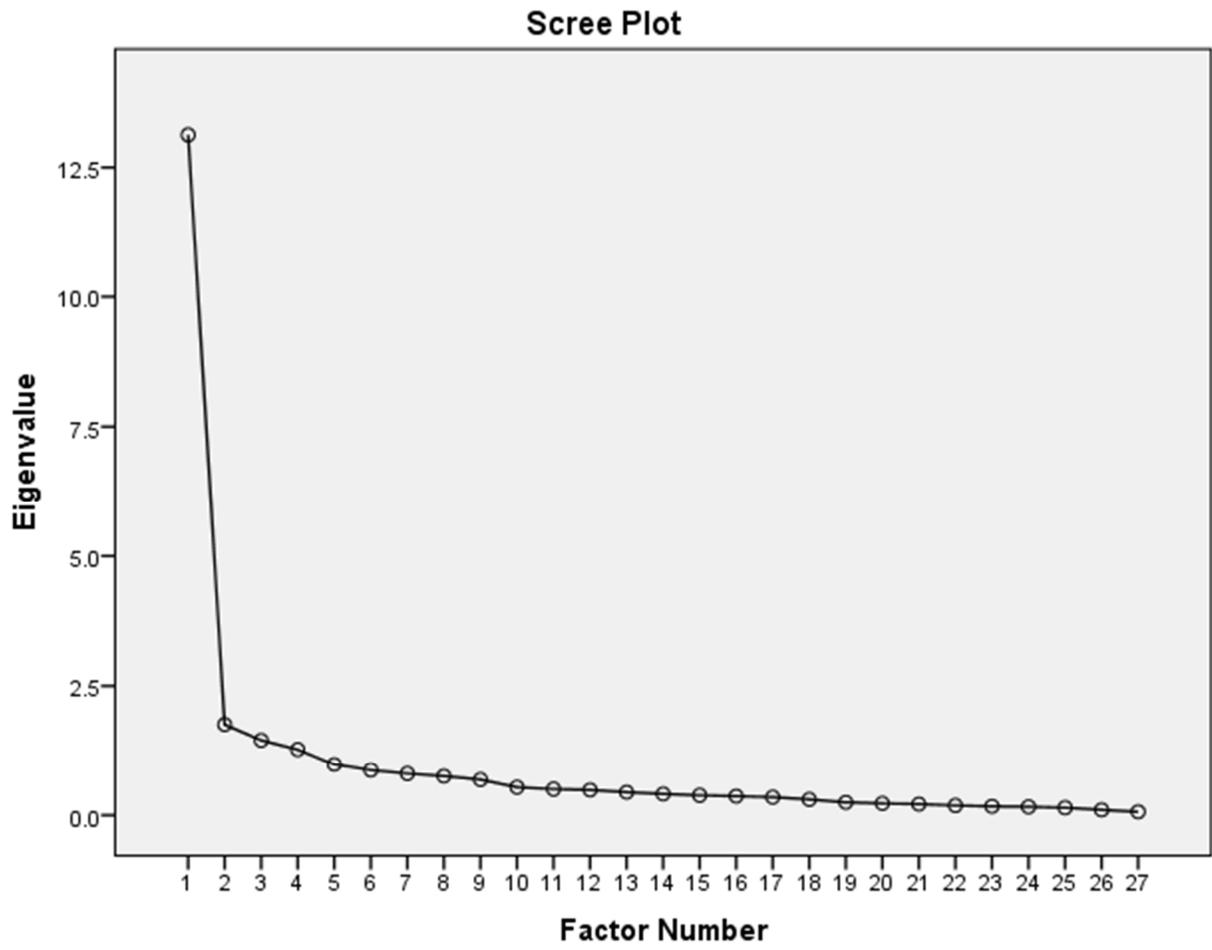


Figure 3. *Scree plot for IUS-27 1-factor model used in Study 2*

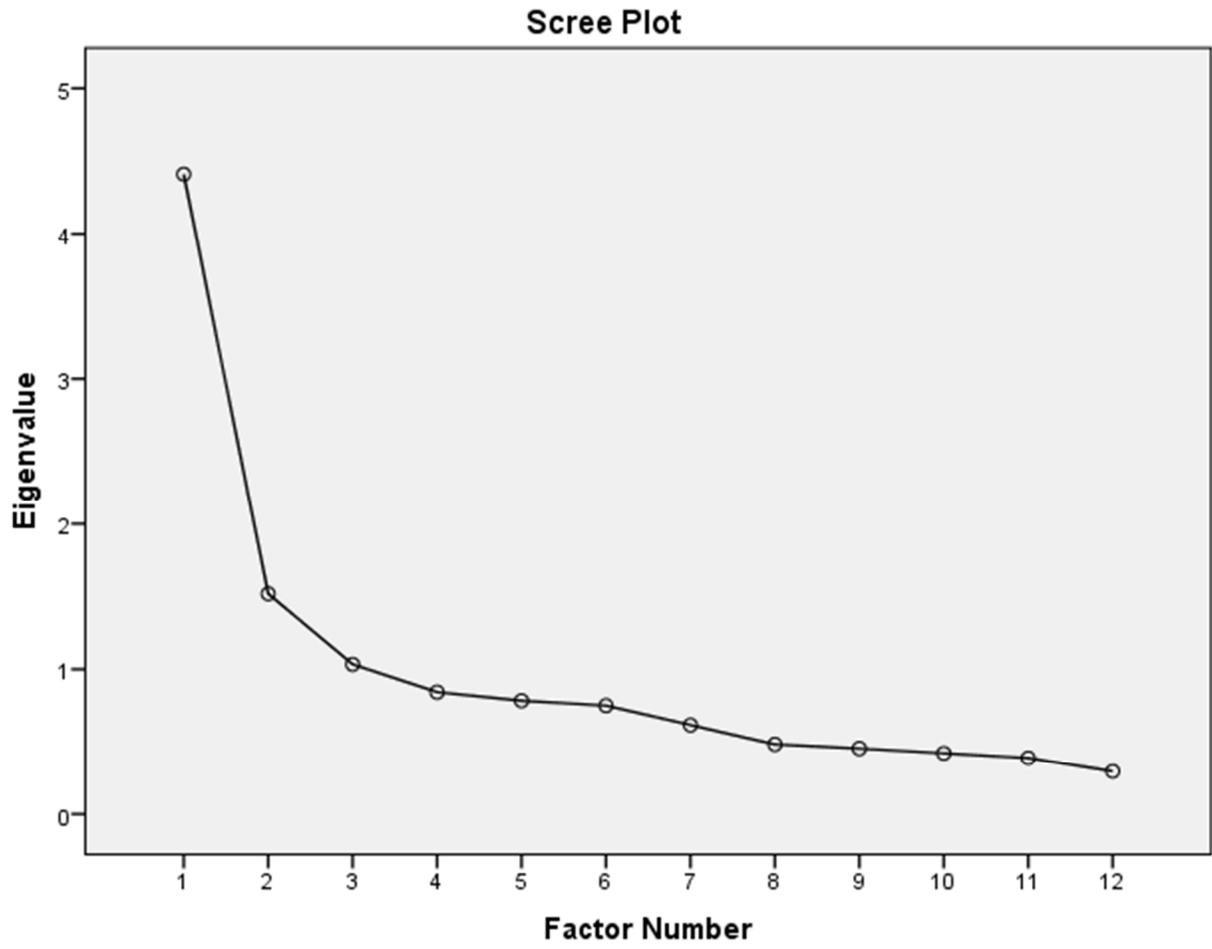


Figure 4. *Scree plot for PNS-12 Study 2 Exploratory Factor Analysis*

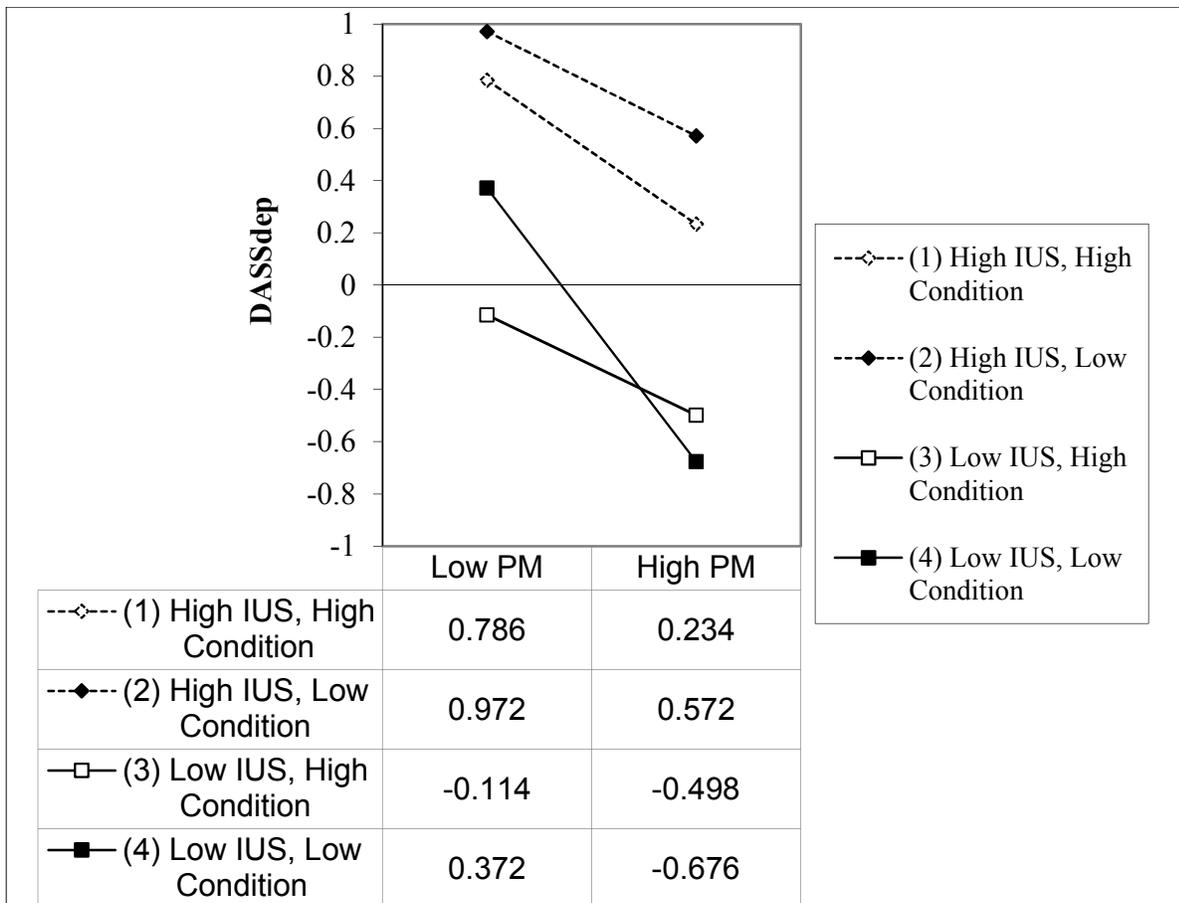


Figure 5. *The interaction of presence of meaning, intolerance of uncertainty, and condition predicting scores on the DASSdep where low condition is equal to the base uncertainty condition and high condition is equal to the existential uncertainty condition.*

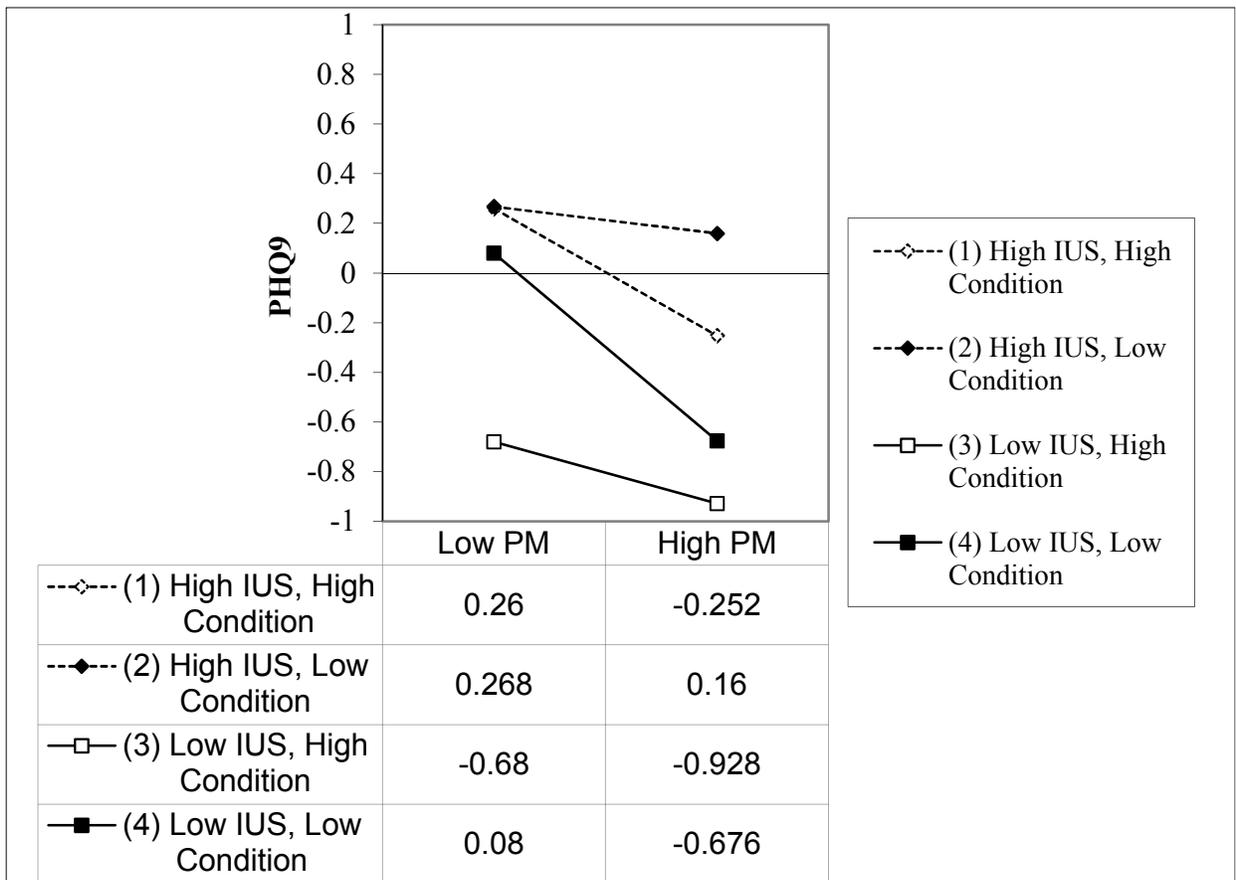


Figure 6. *The interaction of presence of meaning, intolerance of uncertainty, and condition predicting PHQ-9 scores where low condition is equal to the base uncertainty condition and high condition is equal to the existential uncertainty condition.*

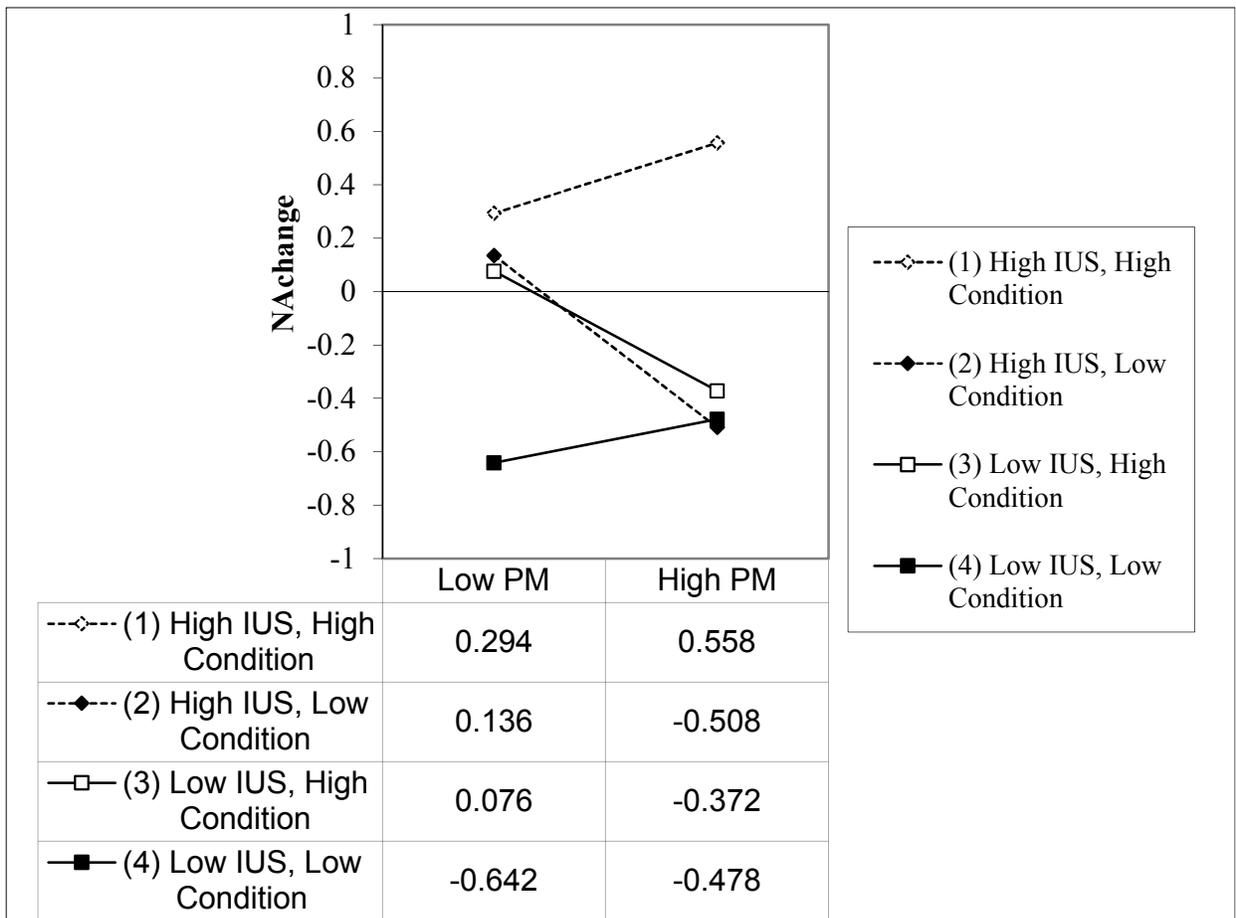


Figure 7. *The interaction of presence of meaning, intolerance of uncertainty, and condition predicting change in negative affect scores where low condition is equal to the control condition and high condition is equal to the base uncertainty condition.*

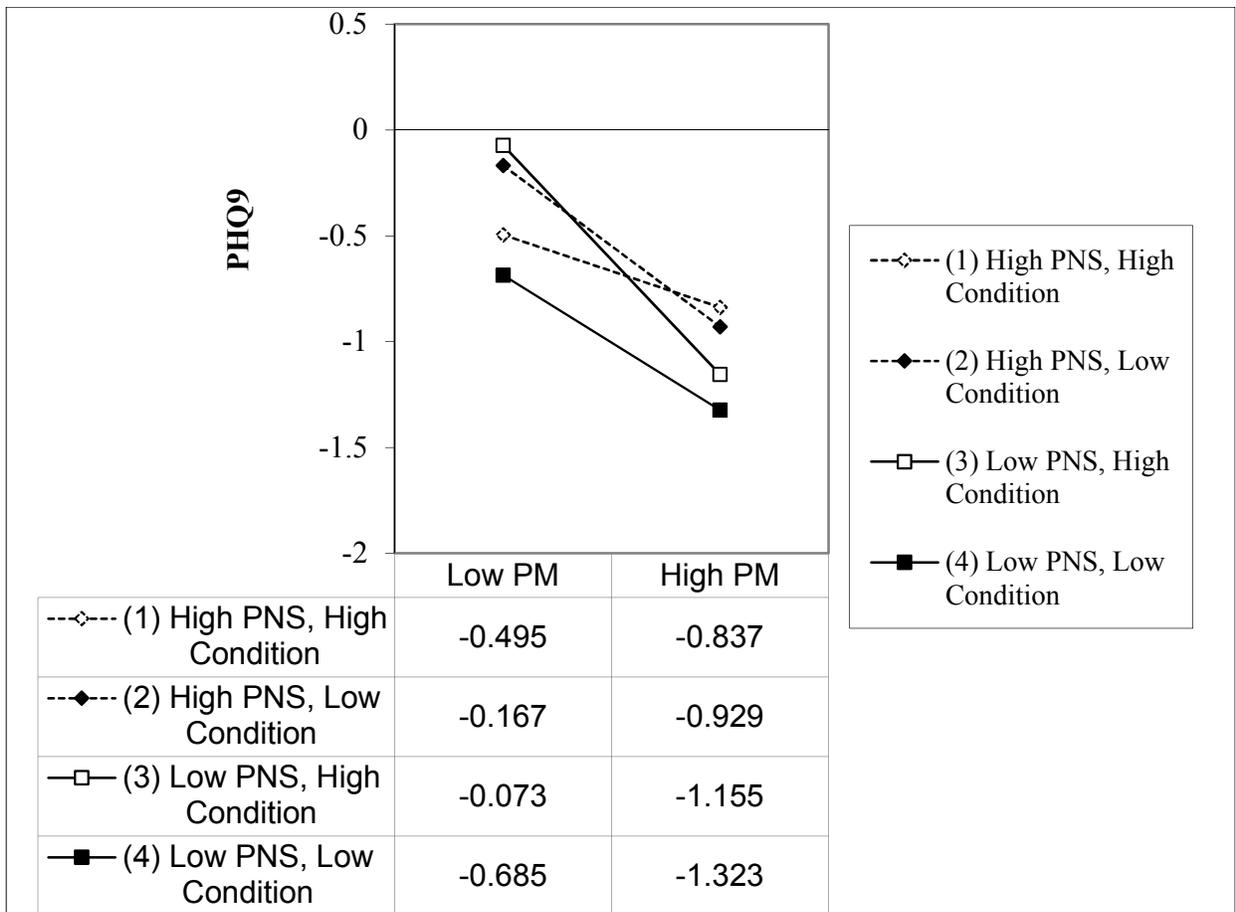


Figure 8. *The interaction of presence of meaning, personal need for structure factor 1, and condition predicting scores on the PHQ-9 where low condition is equal to the control condition and high condition is equal to the base uncertainty condition.*

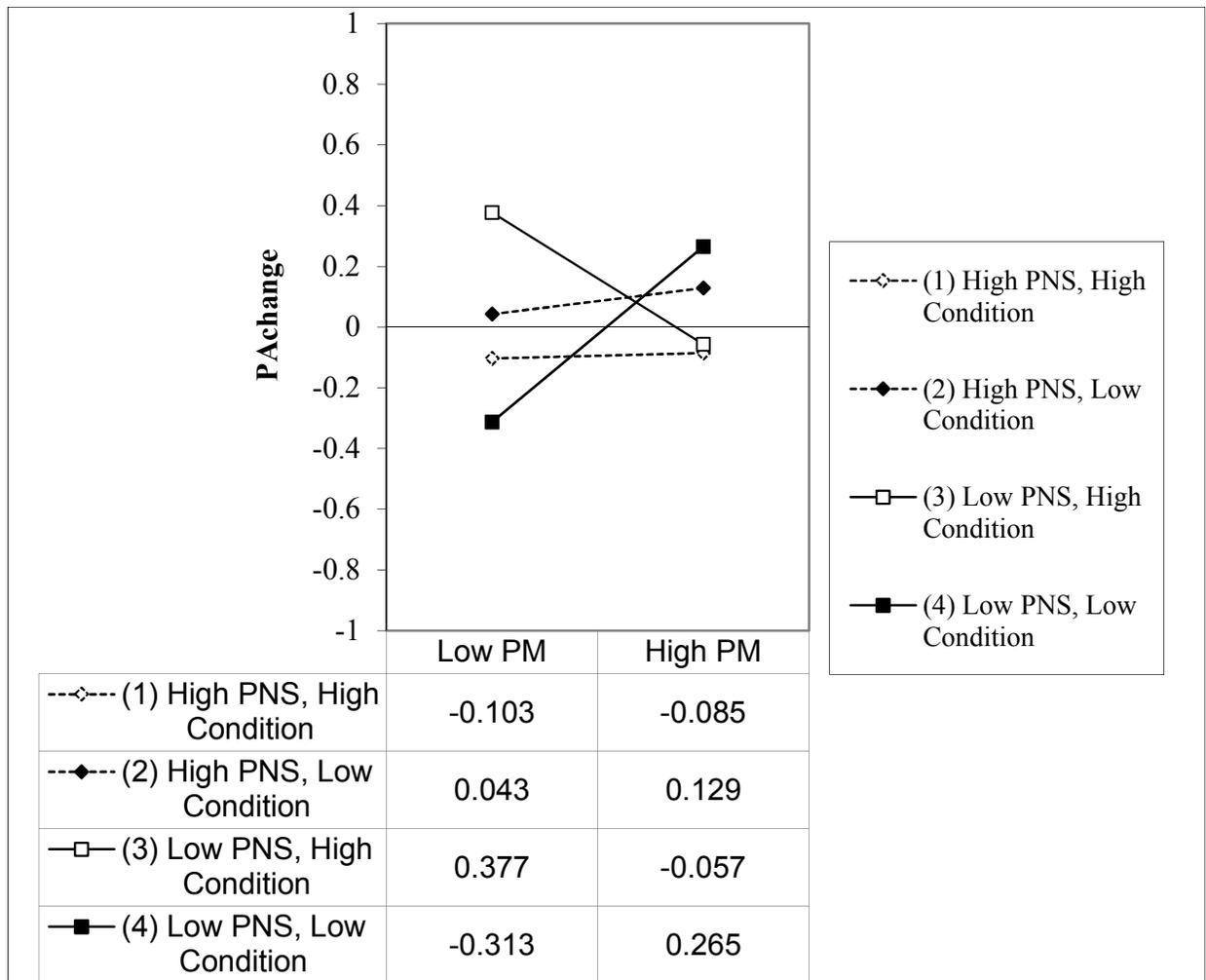


Figure 9. *The interaction of presence of meaning, personal need for structure factor 1, and condition predicting change in positive affect low condition is equal to the control condition and high condition is equal to the existential uncertainty condition.*

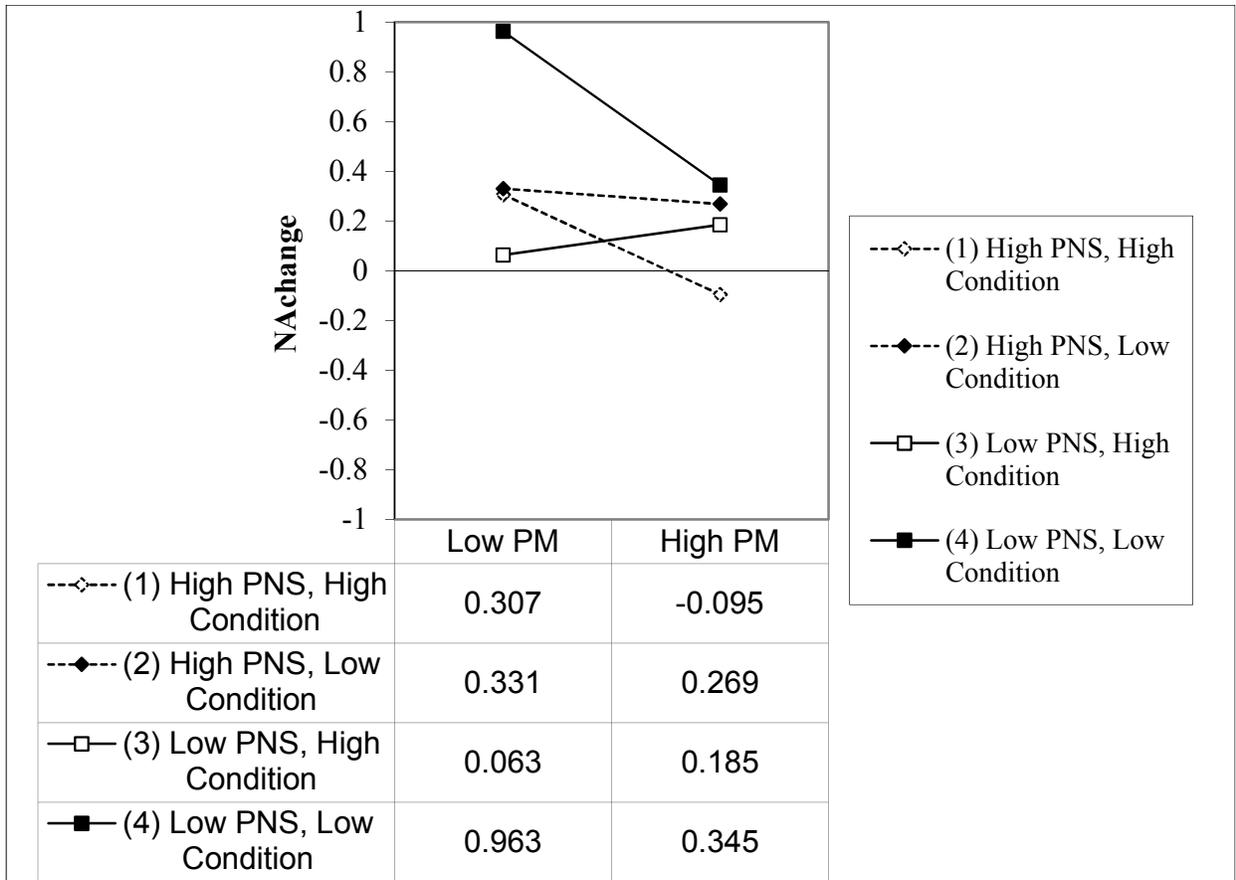


Figure 10. *The interaction of presence of meaning, personal need for structure factor 1, and condition predicting change in negative affect where low condition is equal to the base uncertainty condition and high condition is equal to the existential uncertainty condition.*

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**APPENDICES: Appendix A**  
Study 1 - Consent to Participate in a Research Study  
Colorado State University

**TITLE OF STUDY**

Meaning in Life, Uncertainty and Depressive Symptomatology

**PRINCIPAL INVESTIGATOR:**

Dr. Michael F. Steger, Department of Psychology, PhD in Counseling and Personality Psychology, Contact Information: [michael.f.steger@colostate.edu](mailto:michael.f.steger@colostate.edu)

**CO-PRINCIPAL INVESTIGATOR:**

Jessica Morse, Department of Psychology, 2nd year student in Counseling Psychology PhD program at Colorado State University, Contact Information: [Jessica.Morse@colostate.edu](mailto:Jessica.Morse@colostate.edu)

**WHY AM I BEING INVITED TO TAKE PART IN THIS RESEARCH?**

We are interested in learning more about individuals' personality and well-being. Since we are interested in college students, we would appreciate your help.

**WHO IS DOING THE STUDY?**

The study is being conducted by doctoral student, Jessica Morse, under the guidance of her advisor, Michael Steger, Ph.D.

**WHAT IS THE PURPOSE OF THIS STUDY?**

The purpose of the study is to better understand the potential impacts of uncertainty and how individuals respond differently to uncertainty based on their sense of meaning in life. Specifically, we want to understand how uncertainty relates to meaning and mood.

**WHERE IS THE STUDY GOING TO TAKE PLACE AND HOW LONG WILL IT LAST?**

You will be asked to complete the study on-line at a time and place that is convenient for you. Participation will take approximately 30 minutes of your time.

**WHAT WILL I BE ASKED TO DO?**

You will be asked to complete a few questionnaires regarding demographic information, your sense of meaning in life, uncertainty and experience of depressive symptoms. The surveys include some questions that may seem sensitive or personal. You are free to skip any question or item for any reason.

**ARE THERE REASONS WHY I SHOULD NOT TAKE PART IN THIS STUDY?**

Participation requires that you are at least 18 years of age and currently enrolled in college courses.

**WHAT ARE THE POSSIBLE RISKS AND DISCOMFORTS?**

Due to the sensitive nature of some of the questionnaires, there is a slight risk of emotional distress associated with this study. If any of the questions cause you emotional distress, please feel free to contact (970) 491-6053 to speak to a CSU-Health Network counselor.

**ARE THERE ANY BENEFITS FROM TAKING PART IN THIS STUDY?**

There are no direct benefits from your participation in this study, although it will help us to better understand the how uncertainty, meaning and depressive symptoms are related.

**DO I HAVE TO TAKE PART IN THE STUDY?**

Your participation in this research is voluntary. If you decide to participate in the study, you may withdraw your consent and stop participating at any time without penalty or loss of benefits to which you are otherwise entitled.

**WHO WILL SEE THE INFORMATION THAT I GIVE?**

We will keep private all research records that identify you, to the extent allowed by law.

This study is anonymous. We are not obtaining your name or other identifiable data from you, so no one, not even members of the research team, will be able to identify you or your data. Your information will be combined with information from other people taking part in the study. When we write about the study to share it with other researchers, we will write about the combined information we have gathered.

**WILL I RECEIVE ANY COMPENSATION FOR TAKING PART IN THIS STUDY?**

You will receive 1/2 experimental credit for your participation today.

**WHAT HAPPENS IF I AM INJURED BECAUSE OF THE RESEARCH?**

The Colorado Governmental Immunity Act determines and may limit Colorado State University's legal responsibility if an injury happens because of this study. Claims against the University must be filed within 180 days of the injury.

**WHAT IF I HAVE QUESTIONS?**

Before you decide whether to accept this invitation to take part in the study, please ask any questions that might come to mind now. Later, if you have questions about the study, you can contact Jessica Morse at [Jessica.morse@colostate.edu](mailto:Jessica.morse@colostate.edu) or Dr. Michael Steger at [michael.f.steger@colostate.edu](mailto:michael.f.steger@colostate.edu) or If you have any questions about your rights as a volunteer in this research, contact Janell Barker, Human Research Administrator at 970-491-1655. You are free to print out a copy of this consent form to take with you for your records.

This consent form was approved by the CSU Institutional Review Board for the protection of human subjects in research on \_\_\_\_\_.

If you have read and understood the above information and consent to participating in the study, please click the "I consent" button to indicate your consent to participate in the study.

Study 2 - Consent to Participate in a Research Study  
Colorado State University

**TITLE OF STUDY**

Meaning in Life, Uncertainty and Depressive Symptomatology

**PRINCIPAL INVESTIGATOR:**

Dr. Michael F. Steger, Department of Psychology, PhD in Counseling and Personality Psychology, Contact Information: [michael.f.steger@colostate.edu](mailto:michael.f.steger@colostate.edu)

**CO-PRINCIPAL INVESTIGATOR:**

Jessica Morse, Department of Psychology, 2nd year student in Counseling Psychology PhD program at Colorado State University, Contact Information: [Jessica.Morse@colostate.edu](mailto:Jessica.Morse@colostate.edu)

**WHY AM I BEING INVITED TO TAKE PART IN THIS RESEARCH?**

We are interested in learning more about individuals' personality and well-being. Since we are interested in college students, we would appreciate your help.

**WHO IS DOING THE STUDY?**

The study is being conducted by doctoral student, Jessica Morse, under the guidance of her advisor, Michael Steger, Ph.D.

**WHAT IS THE PURPOSE OF THIS STUDY?**

The purpose of the study is to better understand the potential impacts of uncertainty and how individuals respond differently to uncertainty based on sense of meaning in life. Specifically, we want to understand how uncertainty relates to meaning and mood.

**WHERE IS THE STUDY GOING TO TAKE PLACE AND HOW LONG WILL IT LAST?**

You will be asked to complete the study on-line at a time and place that is convenient for you. Participation will take approximately 30 minutes of your time.

**WHAT WILL I BE ASKED TO DO?**

You will be asked to complete a few questionnaires regarding demographic information, your sense of meaning in life, uncertainty and experience of depressive symptoms. The surveys include some questions that may seem sensitive or personal. You are free to skip any question or item for any reason. You will also be asked to view and evaluate several paintings and write a short answer response to a scenario presented.

**ARE THERE REASONS WHY I SHOULD NOT TAKE PART IN THIS STUDY?**

Participation requires that you are at least 18 years of age and currently enrolled in college courses.

**WHAT ARE THE POSSIBLE RISKS AND DISCOMFORTS?**

Due to the sensitive nature of some of the questionnaires, there is a slight risk of emotional distress associated with this study. If any of the questions cause you emotional distress, please feel free to contact (970) 491-6053 to speak to a CSU-Health Network counselor.

**ARE THERE ANY BENEFITS FROM TAKING PART IN THIS STUDY?**

There are no direct benefits from your participation in this study, although it will help us to better understand the how uncertainty, meaning and depressive symptoms are related.

**DO I HAVE TO TAKE PART IN THE STUDY?**

Your participation in this research is voluntary. If you decide to participate in the study, you may withdraw your consent and stop participating at any time without penalty or loss of benefits to which you are otherwise entitled.

**WHO WILL SEE THE INFORMATION THAT I GIVE?**

We will keep private all research records that identify you, to the extent allowed by law.

This study is anonymous. We are not obtaining your name or other identifiable data from you, so no one, not even members of the research team, will be able to identify you or your data. Your information will be combined with information from other people taking part in the study. When we write about the study to share it with other researchers, we will write about the combined information we have gathered.

**WILL I RECEIVE ANY COMPENSATION FOR TAKING PART IN THIS STUDY?**

You will receive 1/2 experimental credit for your participation today.

**WHAT HAPPENS IF I AM INJURED BECAUSE OF THE RESEARCH?**

The Colorado Governmental Immunity Act determines and may limit Colorado State University's legal responsibility if an injury happens because of this study. Claims against the University must be filed within 180 days of the injury.

**WHAT IF I HAVE QUESTIONS?**

Before you decide whether to accept this invitation to take part in the study, please ask any questions that might come to mind now. Later, if you have questions about the study, you can contact Jessica Morse at [Jessica.morse@colostate.edu](mailto:Jessica.morse@colostate.edu) or Dr. Michael Steger at [michael.f.steger@colostate.edu](mailto:michael.f.steger@colostate.edu). If you have any questions about your rights as a volunteer in this research, contact Janell Barker, Human Research Administrator at 970-491-1655. You are free to print out a copy of this consent form to take with you for your records.

This consent form was approved by the CSU Institutional Review Board for the protection of human subjects in research on July 8, 2016.

If you have read and understood the above information and consent to participating in the study, please click the "I consent" button to indicate your consent to participate in the study.

**APPENDICES: Appendix B**  
Study 1 Demographic Data Form

- 1) What is your age?  
\_\_\_\_\_ years old
  
- 2) What is your gender? (please choose one)  
 Male  
 Female  
 Transgender  
 I prefer not to answer
  
- 3) What race/ethnicity do you identify with the most? (please choose one)  
 African American/Black  
 Alaska Native  
 American Indian/Native American  
 Asian American  
 Caucasian/White  
 Hawaiian/Pacific Islander  
 Latino or Hispanic  
 Middle Eastern American  
 Other (Please specify: \_\_\_\_\_)
  
- 4) What is your religion? (please choose one)  
 Christian  
 Jewish  
 Muslim  
 Buddhist  
 Hindu  
 Atheist or Agnostic  
 I prefer not to answer
  
- 5) How religious are you?  
 Very  
 Somewhat  
 Not very  
 I prefer not to answer
  
- 6) What year are you in college?  
 Freshman  
 Sophomore  
 Junior  
 Senior  
 Other  
 I prefer not to answer

### Meaning in Life Questionnaire (MLQ)

**MLQ** - Please take a moment to think about what makes your life feel important to you. Please respond to the following statements as truthfully and accurately as you can, and also please remember that these are very subjective questions and that there are no right or wrong answers. Please answer according to the scale below:

<b>Strongly Disagree</b>	<b>Disagree</b>	<b>Neutral</b>	<b>Agree</b>	<b>Strongly Agree</b>
<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>

1. \_\_\_\_\_ I understand my life's meaning.
2. \_\_\_\_\_ I am looking for something that makes my life feel meaningful.
3. \_\_\_\_\_ I am always looking to find my life's purpose.
4. \_\_\_\_\_ My life has a clear sense of purpose.
5. \_\_\_\_\_ I have a good sense of what makes my life meaningful.
6. \_\_\_\_\_ I have discovered a satisfying life purpose.
7. \_\_\_\_\_ I am always searching for something that makes my life feel significant.
8. \_\_\_\_\_ I am seeking a purpose or mission for my life.
9. \_\_\_\_\_ My life has no clear purpose.
10. \_\_\_\_\_ I am searching for meaning in my life.

## Intolerance of Uncertainty Scale

IUS

### IUS

You will find below a series of statements which describe how people may react to the uncertainties of life. Please use the scale below to describe to what extent each item is characteristic of you. Please circle a number (1 to 5) that describes you best.

	Not at all characteristic of me	Somewhat characteristic of me	Entirely characteristic of me
1. Uncertainty stops me from having a firm opinion. ....	1.....	2.....	3..... 4..... 5.....
2. Being uncertain means that a person is disorganized. ....	1.....	2.....	3..... 4..... 5.....
3. Uncertainty makes life intolerable. ....	1.....	2.....	3..... 4..... 5.....
4. It's unfair not having any guarantees in life. ....	1.....	2.....	3..... 4..... 5.....
5. My mind can't be relaxed if I don't know what will happen tomorrow. ....	1.....	2.....	3..... 4..... 5.....
6. Uncertainty makes me uneasy, anxious, or stressed. ....	1.....	2.....	3..... 4..... 5.....
7. Unforeseen events upset me greatly. ....	1.....	2.....	3..... 4..... 5.....
8. It frustrates me not having all the information I need. ....	1.....	2.....	3..... 4..... 5.....
9. Uncertainty keeps me from living a full life. ....	1.....	2.....	3..... 4..... 5.....
10. One should always look ahead so as to avoid surprises. ....	1.....	2.....	3..... 4..... 5.....

- |   | Not at all<br>characteristic<br>of me | Somewhat<br>characteristic<br>of me | Entirely<br>characteristic<br>of me |
|---|---------------------------------------|-------------------------------------|-------------------------------------|
| 11. A small unforeseen event can spoil everything, even with the best of planning. .... | 1.....                                | 2.....                              | 3.....4.....5.....                  |
| 12. When it's time to act, uncertainty paralyzes me. ....                               | 1.....                                | 2.....                              | 3.....4.....5.....                  |
| 13. Being uncertain means that I am not first rate. ....                                | 1.....                                | 2.....                              | 3.....4.....5.....                  |
| 14. When I am uncertain, I can't go forward. ....                                       | 1.....                                | 2.....                              | 3.....4.....5.....                  |
| 15. When I am uncertain I can't function very well. ....                                | 1.....                                | 2.....                              | 3.....4.....5.....                  |
| 16. Unlike me, others always seem to know where they are going with their lives. ....   | 1.....                                | 2.....                              | 3.....4.....5.....                  |
| 17. Uncertainty makes me vulnerable, unhappy, or sad. ....                              | 1.....                                | 2.....                              | 3.....4.....5.....                  |
| 18. I always want to know what the future has in store for me. ....                     | 1.....                                | 2.....                              | 3.....4.....5.....                  |
| 19. I can't stand being taken by surprise. ....   | 1.....                                | 2.....                              | 3.....4.....5.....                  |
| 20. The smallest doubt can stop me from acting. ....                                    | 1.....                                | 2.....                              | 3.....4.....5.....                  |
| 21. I should be able to organize everything in advance. ....                            | 1.....                                | 2.....                              | 3.....4.....5.....                  |
| 22. Being uncertain means that I lack confidence. ....                                  | 1.....                                | 2.....                              | 3.....4.....5.....                  |

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	Not at all characteristic of me	Somewhat characteristic of me	Entirely characteristic of me
23. I think it's unfair that other people seem sure about their future. ....	1.....	2.....	3.....4.....5.....
24. Uncertainty keeps me from sleeping soundly. ....	1.....	2.....	3.....4.....5.....
25. I must get away from all uncertain situations. ....	1.....	2.....	3.....4.....5.....
26. The ambiguities in life stress me.....	1.....	2.....	3.....4.....5.....
27. I can't stand being undecided about my future. ....	1.....	2.....	3.....4.....5.....

## Tolerance of Ambiguity Scale

### Tolerance of Ambiguity Scale

Please respond to the following statements by indicating the extent to which you agree or disagree with them. Circle the number at the right that best represents your evaluation of the item. SA = Strongly Agree; MA = Moderately Agree; A = Slightly Agree; N = Neither Agree Nor Disagree; D = Slightly Disagree; MD = Moderately Disagree; SD = Strongly Disagree. The scoring key is on page 83 of Appendix I.

	SA	MA	A	N	D	MD	SD
1. An expert who doesn't come up with a definite answer probably doesn't know too much.	7	6	5	4	3	2	1
2. I would like to live in a foreign country for a while.	7	6	5	4	3	2	1
3. There is really no such thing as a problem that can't be solved.	7	6	5	4	3	2	1
4. People who fit their lives to a schedule probably miss most of the joy of living.	7	6	5	4	3	2	1
5. A good job is one where what is to be done and how it is to be done are always clear.	7	6	5	4	3	2	1
6. It is more fun to tackle a complicated problem than to solve a simple one.	7	6	5	4	3	2	1
7. In the long run it is possible to get more done by tackling small, simple problems rather than large and complicated ones.	7	6	5	4	3	2	1
8. Often the most interesting and stimulating people are those who don't mind being different and original.	7	6	5	4	3	2	1
9. What we are used to is always preferable to what is unfamiliar.	7	6	5	4	3	2	1
10. People who insist upon a yes or no answer just don't know how complicated things really are.	7	6	5	4	3	2	1
11. A person who leads an even, regular life in which few surprises or unexpected happenings arise really has a lot to be grateful for.	7	6	5	4	3	2	1
12. Many of our most important decisions are based upon insufficient information.	7	6	5	4	3	2	1
13. I like parties where I know most of the people more than ones where all or most of the people are complete strangers.	7	6	5	4	3	2	1
14. Teachers or supervisors who hand out vague assignments give one a chance to show initiative and originality.	7	6	5	4	3	2	1
15. The sooner we all acquire similar values and ideals the better.	7	6	5	4	3	2	1
16. A good teacher is one who makes you wonder about your way of looking at things.	7	6	5	4	3	2	1

SOURCE: Budner, 1962.

## Personal Need for Structure Scale

Read each of the following statements and decide how much you agree with each according to your attitudes, beliefs, and experiences. It is important for you to realize that there are no "right" or "wrong" answers to these questions. People are different, and we are interested in how you feel. Please respond according to the following 6-point scale:

1 = *strongly disagree*      4 = *slightly agree*  
2 = *moderately disagree*    5 = *moderately agree*  
3 = *slightly disagree*      6 = *strongly agree*

1. It upsets me to go into a situation without knowing what I can expect from it.
2. I'm not bothered by things that interrupt my daily routine.<sup>a</sup>
3. I enjoy having a clear and structured mode of life.
4. I like to have a place for everything and everything in its place.
5. I enjoy being spontaneous.<sup>a,b</sup>
6. I find that a well-ordered life with regular hours makes my life tedious.<sup>a</sup>
7. I don't like situations that are uncertain.
8. I hate to change my plans at the last minute.
9. I hate to be with people who are unpredictable.

10. I find that a consistent routine enables me to enjoy life more.
11. I enjoy the exhilaration of being in unpredictable situations.<sup>a</sup>
12. I become uncomfortable when the rules in a situation are not clear.

*Note.* From *Assessing Cognitive Need: The Development of the Personal Need for Structure and the Personal Fear of Invalidity Scales* by M. M. Thompson, M. E. Naccarato, and K. E. Parker, 1989. Paper presented at the Annual Meeting of the Canadian Psychological Association, Halifax, Nova Scotia. Copyright © 1986 by M. M. Thompson, M. E. Naccarato, and K. E. Parker. Reprinted by permission. Also from *Measuring Cognitive Needs: The Development and Validation of the Personal Need for Structure (PNS) and Personal Fear of Invalidity (PFI) Measures* by M. M. Thompson, M. E. Naccarato, and K. E. Parker, 1992. Manuscript submitted for publication. Copyright © 1986 by M. M. Thompson, M. E. Naccarato, and K. E. Parker. Reprinted by permission.

<sup>a</sup> Item is reversed scored. <sup>b</sup> Note that we have dropped this item from our use of the scale.

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## CESD-R

Center for Epidemiologic Studies Depression Scale – Revised (CESD-R)

Below is a list of the ways you might have felt or behaved. Please check the boxes to tell me how often you have felt this way in the past week or so.	Last Week				Nearly every day for 2 weeks
	Not at all <i>or</i> Less than 1 day	1 - 2 days	3 - 4 days	5 - 7 days	
My appetite was poor.	0	1	2	3	4
I could not shake off the blues.	0	1	2	3	4
I had trouble keeping my mind on what I was doing.	0	1	2	3	4
I felt depressed.	0	1	2	3	4
My sleep was restless.	0	1	2	3	4
I felt sad.	0	1	2	3	4
I could not get going.	0	1	2	3	4
Nothing made me happy.	0	1	2	3	4
I felt like a bad person.	0	1	2	3	4
I lost interest in my usual activities.	0	1	2	3	4
I slept much more than usual.	0	1	2	3	4
I felt like I was moving too slowly.	0	1	2	3	4
I felt fidgety.	0	1	2	3	4
I wished I were dead.	0	1	2	3	4
I wanted to hurt myself.	0	1	2	3	4
I was tired all the time.	0	1	2	3	4
I did not like myself.	0	1	2	3	4
I lost a lot of weight without trying to.	0	1	2	3	4
I had a lot of trouble getting to sleep.	0	1	2	3	4
I could not focus on the important things.	0	1	2	3	4

**PHQ-9**

<b>Patient Health Questionnaire (PHQ-9)</b>				
Over the <i>last 2 weeks</i> , how often have you been bothered by any of the following problems?				
	Nearly every day <b>3</b>	More than half the days <b>2</b>	Several days <b>1</b>	Not at all <b>0</b>
Little interest or pleasure in doing things				
Feeling down, depressed, or hopeless				
Trouble falling or staying asleep, or sleeping too much				
Feeling tired or having little energy				
Poor appetite or overeating				
Feeling bad about yourself—or that you are a failure or have let yourself or your family down				
Trouble concentrating on things, such as reading the newspaper or watching television				
Moving or speaking so slowly that other people could have noticed. Or the opposite—being so fidgety or restless that you have been moving around a lot more than usual				
Thoughts that you would be better off dead, or of hurting yourself in some way				

DASS

# DASS 21

Please read each statement and circle a number 0, 1, 2 or 3 which indicates how much the statement applied to you *over the past week*. There are no right or wrong answers. Do not spend too much time on any statement.

*The rating scale is as follows:*

- 0 Did not apply to me at all
- 1 Applied to me to some degree, or some of the time
- 2 Applied to me to a considerable degree, or a good part of time
- 3 Applied to me very much, or most of the time

1	I found it hard to wind down	0	1	2	3
2	I was aware of dryness of my mouth	0	1	2	3
3	I couldn't seem to experience any positive feeling at all	0	1	2	3
4	I experienced breathing difficulty (e.g., excessively rapid breathing, <input type="checkbox"/> breathlessness in the absence of physical exertion)	0	1	2	3
5	I found it difficult to work up the initiative to do things	0	1	2	3
6	I tended to over-react to situations	0	1	2	3
7	I experienced trembling (e.g., in the hands)	0	1	2	3
8	I felt that I was using a lot of nervous energy	0	1	2	3
9	I was worried about situations in which I might panic and make <input type="checkbox"/> a fool of myself	0	1	2	3
10	I felt that I had nothing to look forward to	0	1	2	3
11	I found myself getting agitated	0	1	2	3
12	I found it difficult to relax	0	1	2	3
13	I felt down-hearted and blue	0	1	2	3
14	I was intolerant of anything that kept me from getting on with <input type="checkbox"/> what I was doing	0	1	2	3
15	I felt I was close to panic	0	1	2	3
16	I was unable to become enthusiastic about anything	0	1	2	3
17	I felt I wasn't worth much as a person	0	1	2	3
18	I felt that I was rather touchy	0	1	2	3
19	I was aware of the action of my heart in the absence of physical <input type="checkbox"/> exertion (eg, sense of heart rate increase, heart missing a beat)	0	1	2	3
20	I felt scared without any good reason	0	1	2	3
21	I felt that life was meaningless	0	1	2	3

## Positive and Negative Affect Schedule

### The PANAS

This scale consists of a number of words that describe different feelings and emotions. Read each item and then mark the appropriate answer in the space next to that word. Indicate to what extent [INSERT APPROPRIATE TIME INSTRUCTIONS HERE]. Use the following scale to record your answers.

1 very slightly or not at all	2 a little	3 moderately	4 quite a bit	5 extremely
	_____ interested		_____ irritable	
	_____ distressed		_____ alert	
	_____ excited		_____ ashamed	
	_____ upset		_____ inspired	
	_____ strong		_____ nervous	
	_____ guilty		_____ determined	
	_____ scared		_____ attentive	
	_____ hostile		_____ jittery	
	_____ enthusiastic		_____ active	
	_____ proud		_____ afraid	

We have used PANAS with the following time instructions:

- Moment (you feel this way right now, that is, at the present moment)
- Today (you have felt this way today)
- Past few days (you have felt this way during the past few days)
- Week (you have felt this way during the past week)
- Past few weeks (you have felt this way during the past few weeks)
- Year (you have felt this way during the past year)
- General (you generally feel this way, that is, how you feel on the average)

## Paintings



Figure 2. Wassily Kandinsky's *Composition VI* used in Study 4. Reproduced with permission. © 2005 Artists Rights Society (ARS), New York/ADAGP, Paris.



Figure 1. Jackson Pollock's *Guardians of the Secret* used in Study 3. Reproduced with permission. © 2005 The Pollock-Krasner Foundation/Artists Rights Society (ARS), New York.

Wyndham Lewis  
Workshop c. 1914-5



## Study 2 Final Survey

1) What is your age?

\_\_\_\_\_ years old

2) What is your gender? (please choose one)

\_\_\_ Male

\_\_\_ Female

\_\_\_ Transgender

\_\_\_ I prefer not to answer

3) How would you rate your mood right now on a scale of 1 to 10, where 1= terrible and 10= excellent?

4) How many hours per week do you typically study? \_\_\_\_

5) What race/ethnicity do you identify with the most? (please choose one)

\_\_\_ African American/Black

\_\_\_ Alaska Native

\_\_\_ American Indian/Native American

\_\_\_ Asian American

\_\_\_ Caucasian/White

\_\_\_ Hawaiian/Pacific Islander

\_\_\_ Latino or Hispanic

\_\_\_ Middle Eastern American

\_\_\_ Other (Please specify: \_\_\_\_\_)

6) How long is your commute to campus?

\_\_\_ Less than 5 minutes

\_\_\_ 5-15 minutes

\_\_\_ 15-30 minutes

\_\_\_ More than 30 minutes

7) What is your religion? (please choose one)

\_\_\_ Christian

\_\_\_ Jewish

\_\_\_ Muslim

\_\_\_ Buddhist

\_\_\_ Hindu

\_\_\_ Atheist

\_\_\_ Agnostic

\_\_\_ I prefer not to answer

8) How many CSU sports games have you gone to while attending CSU?

0-1

2-4

5-10

More than 10

9) How religious are you?

Very

Somewhat

Not very

I prefer not to answer

10) To help the researchers with future studies, please briefly state what you believe this study is about: \_\_\_\_\_

**APPENDICES: Appendix C**  
Study 1 & 2 - Debriefing Information

Objective of Research

This study is concerned with the interaction between one's sense of meaning in life, tolerance of uncertainty, and depressive symptoms.

General Information

Your participation is greatly appreciated and will help psychologists to better understand the relationship between meaning in life, tolerance of uncertainty, depressive symptoms and overall psychological functioning. If you would like to receive a report of this research when it is completed (or a summary of the findings), please contact Jessica Morse at [Jessica.Morse@colostate.edu](mailto:Jessica.Morse@colostate.edu) or Michael Steger, Ph.D. at [michael.f.steger@colostate.edu](mailto:michael.f.steger@colostate.edu).

Safety

If your participation in this study has contributed to any emotional distress or significant discomfort, you may contact Dr. Susan MacQuiddy, Director of Counseling Services at CSU-Health Network at 970-491-6496. In case of emergency or crisis, on-call counselors are also available 24/7 and can be reached at [970-491-7111](tel:970-491-7111). For a nationwide crisis hotline, please call [1-800-273-8255](tel:1-800-273-8255). Finally, please contact the research investigators directly for assistance and additional debriefing if you experience any distress as a result of this study. Jessica Morse can be reached at [Jessica.Morse@colostate.edu](mailto:Jessica.Morse@colostate.edu). To contact Dr. Michael Steger, send an email to [michael.f.steger@colostate.edu](mailto:michael.f.steger@colostate.edu). If you have any questions about your rights as a volunteer in this research, contact Janell Barker, Human Research Administrator, at [970-491-1655](tel:970-491-1655).

Confidentiality

All information collected in today's study will be confidential, and there will be no way of identifying your responses in the data archive. Identifying the responses of individual participants is not important. Instead, this research will be focused on examining general patterns that emerge when the data are aggregated together.

**Please do not disclose research procedures and hypotheses to anyone who might participate in this study between now and the end of data collection, as this could affect the results of the study.**

**Thank you for your participation!**