

# Moderation Effects of Spirituality on Stress and Health

by

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## ABSTRACT

Spirituality has been studied in relation to psychological factors in health for the past decade and has been found to promote positive affect while possibly benefiting health. However, multiple dimensions of spirituality need to be examined systematically before much can be concluded regarding the influence of spirituality on health. One purpose of this study was to test the validity of the four factors of the Psychomatrix Spirituality Inventory (PSI) developed by Wolman using confirmatory factor analysis (CFA): divinity, mindfulness, extrasensory perception, and intellectuality. In addition, the moderation effects of these factors on stress, assessed by cortisol levels, and on perceived cold symptoms induced by a bogus cold viral challenge were investigated among 100 participants as part of a larger study conducted by Nemeroff to identify psychological factors related to perceived cold susceptibility under a bogus viral challenge paradigm.

The analyses of CFA among 265 participants indicated that the four-factor Psychomatrix Spirituality model did not provide a good fit to the data collected by Nemeroff. The shared variances among factors could be the explanation for failure to confirm these four factors. Women developed more cold symptoms than did men post bogus exposure. Mindfulness and extrasensory perception factors buffered the adverse effects of stress on cold symptoms. A three-way-interaction among gender, stress, and mindfulness indicated that the buffering effects of mindfulness on stress and cold symptoms were stronger for women than for men, and the effects were stronger when the stress levels increased. A three-way-interaction was also found among gender, stress, and extrasensory

perception, with the moderation effects of extrasensory perception on stress and cold symptoms stronger for women than for men, and these effects becoming stronger as stress levels elevated.

This study is an important step for understanding the relationships among gender, spiritual factors and cortisol levels under laboratory-induced stress. These results have implications for developing preventions or interventions that incorporate mindfulness practices and take extrasensory perception beliefs into consideration for stress reduction and health promotion.

To My Beloved Family, Teachers, and Friends

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## Chapter 1

### Problem in Perspective

The connections between mind and body have been acknowledged via human experiences throughout history; however, the biological mechanisms of the mind-body connection have only begun to be understood. Health care requires attention to all aspects and dimensions (physical, mental, emotional, social, spiritual, etc.) that make individuals human (Sorajjakool & Lamberton, 2004), and the need for health care providers to address the connection between spirituality and health is widely identified (Young & Koopsen, 2004). Among health care professionals and the public in general, there has been a growing interest in the relationship between spirituality and health, and research addressing this topic has increased tremendously since late 1980s (Sorajjakool & Lamberton). The resurgent interest in spirituality and health not only encouraged researchers to investigate the relationships between religion/spirituality and health but also increased emphasis on training professionals to develop an awareness of and respect for cultural diversity related to religion and/or spirituality. Furthermore, the strength of one's religion and/or spirituality has been recognized as a cultural force (Shafranske & Maloney, 1996).

The definition of religion is restricted to institutionally based dogma, rituals, and traditions, whereas the term "spirituality," which is generally described as a highly individualized search for the sense of connectedness with a transcendent force, implies an inner and more personal process (Pargament, 1997). In the literature on spirituality, the centrality of the relationships between self,

others, and a Higher Power or God is a major focus and a prominent emerging theme (Young & Koopsen, 2004). Sorajjakool and Lamberton (2004) noted that when defining spirituality two practical points for health care professionals must be considered. First is the importance of clarifying how spirituality is defined and measured in studies of spirituality and health. The other is to be aware that the meanings of religiousness and spirituality will vary significantly depending on who is using the terms. Although more sophisticated research has been conducted to address how spirituality/religion affects health, measurement of spirituality/religion constructs in health research has usually been poor in quality, often consisting of a single question, and spirituality has been narrowly defined within Western traditions (Miller & Thoresen, 2003). While researchers have suggested various possible psychological, social, and physiological mediators that may account for the connection between spirituality/religion and health, the nature of religion and spirituality may also explain these effects. More finely delineated measures of spirituality/religion might be related more directly to physical and mental health (Hill & Pargament, 2003). Having a clear definition of spirituality is a critical component when conducting spirituality-related studies, since spirituality may have many different meanings. The present study sought to validate four factors of spirituality, divinity, mindfulness, extrasensory perception, and intellectuality in the Psychomatrix Spirituality Inventory, developed by Wolman (2001). In addition, the moderation effects of divinity, mindfulness, extrasensory perception, and intellectuality on stress and physical symptoms were investigated.

### *Stress and Health*

Stress is a shared common component in major mental illness, causing deterioration or maintenance of symptoms (Dinan, 2005). For instance, the majority of depressed patients experience depression after stressful events, and the maintenance of depressive symptoms is often associated with ongoing psychological stress. Matud and colleagues (2004) investigated the relationship between stress and health in a sample of 1566 female adults and found that depression, anxiety, and somatic symptoms were predicted by chronic stress. Examining the links between perceived stress and a broad set of biological measures among 989 older adults in Taiwan, Goldman, Gleib, Seplaki, Liu, and Weinstein (2005) reported that physiological dysregulation was associated with perceived stress, both at the time of testing and longitudinally. Among the participants' biological reports, persons with higher levels of perceived stress were more likely to have negative levels of several biomarkers related to stress responses such as measures of hypothalamo-pituitary-adrenal (HPA)-activity, immune bunches, cardiovascular function, and metabolic pathways. As perceived stress has been found to affect physiological or behavioral responses, physiological arousal may also alter appraisals and emotional response and, therefore, increase perceived stress (Cohen, Kessler, & Gordon, 1997).

The immune system serves the function of protecting individuals against noxious agents, viruses, bacteria, mutated and abnormal cells, and allergens (Carroll, 1992). Research has consistently shown that psychological stress can

alter the immune system response, which serves as the primary defense against infectious disease and certain cancers and can result in significant negative consequence for health (Kiecolt-Glaser, 1986; Kiecolt-Glaser & Glaser, 2001; Kiecolt-Glaser, McGuire, Robles, & Glaser, 2002). A study with a sample of 48 medical students demonstrated that those who were more stressed had a poorer immune response to producing antibodies to an antigen (Glaser, Kiecolt-Glaser, Bonneau, & Malarkey, 1992). A battery of six immunologic assays that provided information on both qualitative and quantitative aspects of cellular immunity was collected from 38 married women and 38 separated/divorced women (Kiecolt-Glaser, Fisher, Ogrocki, & Stout, 1987). The three functional assays included blastogenesis with two different mitogens, concanavalin A (Con A) and phytohemagglutinin (PHA), plus antibody titers to the latent herpes virus, Epstein-Barr virus (EBV), the infectious agent for infectious mononucleosis. Marital disruption, one of the most stressful life events, was associated with significantly lower qualitative and quantitative immune functioning in women who had been separated one year or less (Kiecolt-Glaser, Fisher, Ogrocki, & Stout). Furthermore, experimental studies also have demonstrated that acute laboratory-induced stress changes quantitative and functional components of cellular immunity (Marsland, Bachen, Cohen, Rabin, & Manuck, 2002). Specifically, perceived stress is associated with poorer cellular immunity (Kiecolt-Glaser & Glaser, 1995). Based on the research discussed above,

psychological stress can have negative effects on individuals' mental health and immune functioning.

*Cold viral challenge paradigm.* Cohen and his colleagues (2005) employed a prospective design over 20 years in which healthy participants were exposed to a virus that causes a mild cold and the participants' psychological factors were evaluated to examine their susceptibility to the common cold. Cohen, Tyrrell, and Smith (1991) had 394 healthy participants complete questionnaires assessing degree of psychological stress, and then participants were given one of five respiratory viruses (rhinovirus type 2, 9, or 14, respiratory syncytial virus, or coronavirus type 229E) through nasal drops. Another 26 participants were administered saline nasal drops. All of the participants were quarantined and monitored for cold symptoms and evidence of infection. The results indicated that psychological stress was associated with an increased risk of acute infectious respiratory illness due to increased rates of infection. Cohen, Frank, Doyle, Skoner, Rabin, and Gwaltney (1998) conducted another study on susceptibility to the common cold in 276 healthy adults. Their research findings also demonstrated that individuals who experienced severe chronic stressors, defined as lasting one month or longer, such as ongoing marital problems and unemployment were more susceptible to rhinovirus-induced colds. Individuals who experienced chronic stressors with marked or severe long-term threats were between two and three times more likely to develop colds than those who did not experience chronic stressors. Moreover, the results revealed that the longer the duration of the stressor,



the greater was the risk for catching colds.

Cohen's (2005) studies have demonstrated that psychological stress is associated with increased risk for developing respiratory illness or cold symptoms post exposure to the cold virus and that this association may be mediated by stress-induced disruption of the regulation of proinflammatory cytokines. Cohen and his colleagues also found that social integration and social support are associated with risk for respiratory illness, and levels of early childhood socioeconomic status (SES) are associated with greater risk of viral-induced illness during adulthood, independent of adult SES. In Cohen's studies, psychological stress was measured by self-report questionnaires. Salivary cortisol has been found to be associated with psychological stress and used as a stress level indicator (or biomarker) in stress and health related studies.

*Cognitive appraisal and cortisol stress response.* It is believed that psychological stress leads to the activation of the hypothalamus-pituitary-adrenal (HPA) axis (Kirschbaum & Hellhammer, 1994). When corticotrophin releasing hormone (CRH) and adreno-corticotropin hormone (ACTH) are released, especially under situations with high ego-involvement, low predictability, low controllability, and novelty, cortisol level rises subsequently. Therefore, the assessment of cortisol in saliva as a biomarker for psychological stress has been a widely accepted and frequently employed method in a variety of clinical and field settings due to the noninvasiveness and laboratory independence of sampling. Saliva samples generally can be obtained stress-free at desired frequency in most

subjects. Sample volume may vary between 0.05-2 ml saliva depending on the sensitivity and reliability of the read-out system involved (Kirschbaum & Hellhammer). Gaab, Rohleder, Nater, and Ehlert (2005) investigated the psychological determinants of the cortisol stress response in 81 healthy male individuals and found anticipatory cognitive appraisal contributed up to 35% of the variance of the salivary cortisol response. Their results pointed out the importance of psychological stress processing for the understanding of physiological stress responses. Individuals' perception of auditory and taste cues were enhanced by the experimentally induced higher levels of cortisol, and their thresholds for sensory information in general, such as somatic symptoms were lowered; therefore, high cortisol levels may contribute directly to the development and maintenance of somatization symptoms (Rief, Shaw, & Fichter, 1998). Since stress and its biological consequences have been shown to relate to the onset and the maintenance of somatic illness and psychiatric disorders, it has been suggested that the modulation of psychological processes should be the target for prevention and intervention from a cognitive-psychobiological perspective.

A significant number of studies have found that exposure to acute and chronic levels of stress can lead to profound physiological changes, including cardiovascular, immune, and neuroendocrine systems, changes that can cause negative health consequences (Astin & Forys, 2004). According to Lazarus (1977), all or most diseases can be considered to be stress-related since individuals' physical bodies may function in a less harmonious or integrated fashion under

conditions that are difficult or dangerous. It is important, therefore, to acknowledge psychological processes concerned with emotions, especially the stress emotions, in understanding the causes of disease and illness. Psychological stress results from cognitive factors leading to the evaluation of threat (Monat & Lazarus, 1991), with the impact of stressful events determined by individuals' perceptions of their stressfulness (Lazarus). Different individuals, or the same individuals across different life circumstances can have significantly different physiological reactions to the same stressor, even with similar levels of coping, performance, and perceived stress (Cacioppo, 1998). Psychological stress reflects an individual's perceptions and evaluations of the potential harm posed by objective environmental experiences. When the environmental demands are perceived to exceed individuals' abilities to cope, they feel stressed and experience negative emotional responses. In other words, stress appraisals are determined through individuals' interpretation of the meaning of an event and their evaluation of the adequacy of their coping resources (Cohen, Kessler, & Gordon, 1995).

The link between stress and physical and psychological health has been well-established in the literature; however, the physical and psychological consequences of experiencing high levels of stress vary significantly across individuals (Beasley, Thompson, & Davidson, 2003). Lazarus (1977) argued, for example, that cognitive appraisals and self-regulatory processes mediate individuals' reactions to stressful transactions; therefore, cognitive appraisals and

self-regulatory processes shape the somatic outcome. Coping processes are always involved in the emotional and somatic outcomes of a stressful transaction. If a person denies a threat of some kind of danger or engages in ways of neutralizing the stressful demands, the person appears to lessen or eliminate the expected stress emotion and the somatic disturbances related to it. Therefore, coping is acknowledged to be a mechanism alters the effect of stress on health.

*Spirituality and Coping.* Coping was defined by Folkman and Lazarus (1980) as the cognitive and behavioral efforts made by an individual to master, tolerate, or reduce external and internal demands and conflicts. Such coping efforts serve to manage or alter the person-environment relationship that is the source of stress and regulates the stressful emotions. Based on this coping theory, it is plausible that religiousness/spirituality might influence the stress-health relationship. Attribution to a higher being or power may help people to make sense of stressful events and life experiences and then to develop more adaptive coping in stressful circumstances. Furthermore, situations perceived as unexplainable or uncontrollable are more likely to evoke a religious coping strategy when unpredictability and lack of control increase stress in general (Lee, 2007). Religiousness and spirituality may provide a cushion alleviating the effects of major or minor stressors on health. For instance, religious rituals may provide physical, emotional, and cognitive cues to assist people in integrating the experiences of the mind, body, and spirit and in achieving peaceful or transcendent states (Idler et al., 2003). Stress hormone levels also appear to be related to degree

of religious involvement (Koenig, 2007). For instance, a longitudinal study conducted by Ironson et al. (2002) found that the relationship of religiousness to longevity was directly mediated by cortisol levels and serving others among long-term AIDS survivors.

Young, Cashwell, and Shcherbakova (2000) examined the moderating effect of spirituality on the relationships between negative life events and psychological adjustment in 303 undergraduates between 18 and 29 years old. Spirituality was assessed by the Human Spirituality Scale (Wheat, 1992) that contains three content dimensions: (1) a larger context or structure in which individuals view their lives; (2) an awareness of life itself and other living things; and (3) a reverent compassion for the welfare of others. The regression analysis suggested that spirituality moderated the relationship between negative life experiences and depression and anxiety. Laubmeier, Zakowski, and Bair (2004) studied the role of spirituality in the psychological adjustment of 95 cancer patients. They found that higher levels of spirituality were associated with less distress, lower symptom severity and better quality of life regardless of how life threatening the patients perceived their illness to be.

Gall, Charbonneau, Clarke, Grant, Joseph and Shouldice (2005) integrated the literature on spirituality, coping, and health and proposed the spiritual framework for coping by adopting the transactional model of stress and coping developed by Folkman and Lazarus(1985). Through appraisal and coping, individuals make meaning out of a stressor, which impacts their well-being. The

appraisal in this framework includes a determination of a stressor as a challenge, threat, harm, or loss and the reappraisal of the significance of the stressor or event after trying to cope with that stressor. According to Beuscher and Beck (2008), coping involves personal beliefs and problem-solving styles, spiritual coping behaviors, and spiritual connections to nature, others and the transcendent relationship with God. Gall et al. reviewed and examined six studies focusing on the use of spirituality in coping with early-stage Alzheimer's disease in older persons based on the spiritual framework. Their findings suggested that persons with Alzheimer's disease draw from their spirituality and faith to find meaning and courage in coping with the challenges of cognitive losses.

Kim and Seidlitz (2002) also reported finding moderation effects of spirituality on the relationship between stress and emotional and physical adjustment. They administered measures of spirituality, daily stress, affect, and physical symptoms at two time points (one month apart) on 113 college students. Participants' spirituality was assessed by the 8-item Spirituality Transcendence Index (STI; Seidlitz, et al., 2002), which refers to a subjective experience of the sacred that affects one's self-perception, feelings, goals, and ability to transcend difficulties. Their results revealed that spirituality buffered the adverse effect of stress on adjustment, controlling for the use of various coping strategies, e.g., problem-focus coping, venting, avoidance, denial, and humor. Spirituality seems to serve as a coping mechanism when people try to make sense of stressful life

events and become more adaptive. How this coping mechanism protects health is discussed further in the next section.

*Coping as a moderator.* Two alternative models have been proposed to explain the mechanism through which coping is linked with mental health outcomes. The main effect (or additive) model suggests that coping has uniform or beneficial effects on psychological health, regardless of the stressfulness or nature of the problem being faced. The relations between coping and outcome are independent of the level of stress. The interactive or stress-buffer model postulated that coping buffers or moderates the impact of stressful episodes to different degrees, depending on the type or degree of stress faced. Coping is considered as a moderator variable, which influences the relations between stress and outcome (Aldwin, & Revenson, 1987; Parkes, 1990; Wilkinson, Walford, & Espnes, 2000). Pearlin and Schooler (1978) indicated that coping resources have three functions: (1) to alter the meaning of the situation or events and make them less stressful in nature, (2) to modify or eliminate the conditions leading to problems, or (3) to manage the level of emotional response to stressors.

Religion or spirituality has been found to function as a moderator buffering the effect of stress (Levin, Taylor, & Chatters, 1995; McAdoo, 1995). There are logical and theoretical reasons why religion or spirituality help people cope with stress and promote health. For example, attribution to a purposeful God may assist people make sense of stressful events, facilitate their adaptation to stressful circumstance, and foster personal growth ultimately (Lee, 2007; Park & Cohen,

1993). The stress-buffering effects of spirituality have been found; however, further work is needed to examine what aspects of spirituality are involved in reducing the adverse effects of stress (Kim & Seidlitz, 2007). Moderating effects of different components of spirituality on stress will be investigated in the present study.

Stress, spirituality, and affective well-being. Stress has also been reported to be associated with negative affect (Denollet & De Vries, 2006), and spirituality may influence health through the experiencing of affect or stress. Park (2007) indicated that it has been shown by many studies that religion/spirituality tended to be related to lower levels of distress or negative affect, while a smaller number of studies have demonstrated that religion/spirituality was positively related to levels of positive affect. Park also concluded from previous research that there were deleterious effects of negative emotional states such as anxiety and depression on physical health, whereas positive affect generated positive effects.

Powers, Cramer, and Gurbka (2007) investigated the relationships among spirituality, life stress, and affective well-being among 136 undergraduate students from a small Catholic liberal arts college. Among all participants, 108 were self-identified as Catholic, 13 were Protestant, 5 were Atheist/Agnostic and 10 were other religious affiliation. Two subscales measured spiritual involvement: Spiritual Life Integration (SLI) and Social Justice Commitment (SJC). SLI measured the frequency and perceived benefits of concrete spiritual practices such as church attendance and use of prayer was concerning a direct relationship with



God and personal faith; SJC pertained to more active and altruistic-oriented social involvement, measured as the extent to which it is important to improve the welfare of others. They found that life stress significantly predicted negative affect and depressive symptoms, and SJC significantly predicted both positive and negative affects and depressive symptoms. SLI did not appear significantly to predict any aspect of affective well-being. SJC is a similar construct to altruism, and both of SJC and altruism were found to be associated with positive affective states. One empirical characteristic that distinguishes SJC from altruism is that altruism was not associated with negative affective states. However, SJC, the sense of serving both God and others, appeared to buffer negative emotions. These results imply that a proactive spiritual outlet, such as adoption of spiritual activities and attitudes, had a greater influence on affective state than did ritual methods, such as engaging in prayer, attending church, and reading scripture solely. Furthermore, altruistic-oriented social involvement may serve as a protective factor against negative affective states for Christian young adults.

Examining the relationship between spirituality and negative and positive affect among 156 undergraduate students, Elam (2001) found that spirituality, which was measured by The Spiritual Involvement and Beliefs Scale (Hatch, Burg, Naberhaus, & Hellmich, 1998), positively predicted positive affect and negatively predicted depression and anxiety. Powell, Shahabi, and Thoresen (2003) examined nine major hypotheses about the impact of religion or spirituality on physical health, for example, mortality, morbidity, disability, or recovery from illness. In

healthy participants, evidence supported the association between church/service attendance and reduction in risk of mortality or improvement on most of the physical and mental health behaviors examined. Spirituality or religion also appeared to protect against cardiovascular diseases, largely due to the healthy lifestyle spirituality promotes. However, research failed to support a link between depth of religiousness and physical health. Spirituality and religion consistently failed to demonstrate protective effects on slowing the progression of cancer or improving recovery from acute illness, but spirituality or religion also impeded recovery from acute illness in some individuals. Based on the research findings discussed above, spirituality has shown to promote positive affects and buffer negative affects; however, the link between depth of spirituality and health has not been well established.

*Spiritual struggles and health.* Psychologists have identified several types of religious and spiritual struggles, including interpersonal and intrapersonal conflicts and struggles with the divine, for example, questioning God's presence, benevolence, sovereignty, and purpose for the individual. Religious and spiritual struggles have also been linked to both negative and positive health outcomes, as these struggles may be especially distressing because they elicit ultimate questions and concerns or lead to spiritual growth and development (Hill & Pargament, 2003; 2008). Fitchett, Rybarczyk, DeMarco, and Nicholas (1999) tested the protective and consolation models of the relationship between religion and health outcome in 96 medical rehabilitation inpatients diagnosed with joint replacement, amputation,

stroke, or other conditions. Religion or spirituality measures included the public and private religiosity, acceptance, positive and negative religious coping, and spirituality injury, which assesses an individual's sense of being troubled by guilt, resentment, or disbelief in God. Their findings showed that religion did not promote better recovery or adjustment for patients, even though it may serve as a source of consolation for some patients with limited recovery. Berg, Fonss, Reed, and VandeCreek (1995) also examined the relationship between religious beliefs and practices, including spiritual injuries, and lengths of stay in the hospital for patient suffering from a major affective disorder. They found that spiritual injury issues are positively associated with longer length of stay in the hospital.

Pargament, Koenig, Tarakeshwar, and Hahn (2001) investigated the relationship between religious struggle with an illness and mortality in 596 inpatients above 55 years old in a longitudinal cohort study. Their research results suggest that religious struggles predict greater risk of mortality following a medical illness in elderly ill men and women. Another study conducted by Edmondson, Park, Chaudoir and Wortmann (2008) on religious struggle, death concerns, and depression in the terminally ill patients suggested that religious struggle is a breakdown in the terror management system that leaves patients vulnerable to terror of death. Spirituality has shown its protective effects on health; however, some aspects of spirituality do not appear to protect people from diseases or facilitate recovery from illness. The definition and measurement of spirituality could significantly impact the effects spirituality demonstrates on health.

Among all different methods of defining spirituality and religiousness, groups of scientists (e.g., Larson, Swyers, & McCullough, 1998; Pargament, 1997) have agreed in at least one notion that these are complex phenomena and worked toward operational definitions (Miller & Thoresen, 2003). Regardless of religious affiliation, a broader understanding of spirituality or religiousness can be used to characterize all individuals. Spirituality or religiousness can be described as *latent constructs* in methodological language. Latent constructs, which are conceptual underlying entities that are not observed directly but can be inferred from observations of some of their component dimensions are complex and usually multidimensional, with no single measure or dimension being likely to capture their essential meaning. As spirituality and religiousness are conceptualized from a scientific perspective as latent and multidimensional constructs, definitional issues may become clearer (Miller & Thoresen). The Psychomatrix Spirituality Inventory is one of the examples that defines spirituality with latent constructs.

#### *Psychomatrix Spirituality Inventory*

Wolman (2001) developed the PsychoMatrix Spirituality Inventory (PSI) to measure the concept of spirituality. When developing the PsychoMatrix Spirituality Inventory, Wolman (2001) included statements of spiritual practices and psycho-spiritual experiences regarding whether individuals do something or have a particular experience, rather than just endorsements of beliefs. In order to establish face validity, he consulted with his family, friends, clergy, other psychologists, academics, writers, musicians, and poets to investigate what kinds

of items would be implied by the general concept of spirituality and why it is so important to include a wide net. Items were selected based on face validity, that is, they had enough relevance to spirituality that most people would agree with. The actual items were based on common associations with the word of *spiritual*, which involved traditional ideas of God, a Supreme Being or a Transcendent Energy Source, reflection on natural phenomena and the beauty and power of nature, and health and healing practices or mind/body experiences. This inventory also captures individuals' experiences of serious physical or emotional illness, religious activities, community involvement, childhood exposure to spiritual practices or ideas, and statements about near-death experiences. The PSI was pilot-tested on 714 individuals, aged from 18 to 80, who participated in conferences related to mind/body awareness, healing, spiritual practices, and consciousness and self-empowerment. These participants were nationally representative regarding geography, socioeconomic status, and educational levels. From the factor analysis of the pilot study data, Wolman named the seven factors that emerged as Divinity, Mindfulness, Intellectuality, Community, Trauma, Extrasensory Perception, and Childhood Spirituality.

*Divinity.* The Divinity factor is associated with the sense of a higher power, divine energy source or God, or the feeling of awesome wonder in the presence of natural phenomena (Wolman, 2001). This factor includes, but is not limited to, traditional religious beliefs and practices. Individuals who score higher on this scale tend to have a stronger awareness of a higher being, especially when

experiencing the beauty and power of nature and the arts. These people may also endorse having had their prayers answered, used angels for guidance, experienced miracles, sensed the sacredness of others, and be committed to activities such as praying for the recovery of a loved one. Individuals scoring low on Divinity adopt a more pragmatic approach to life and have little need to rely on any form of Higher Being for peace of mind. These people prefer counting on themselves, family, and friends for support and nurturing in times of calm or crisis. They make sense of illness and catastrophic events with scientific explanations and are often more naturalistic in their ideologies rather than believing that humans are “here for a purpose.”

*Mindfulness.* The factor of Mindfulness implies an acceptance of the interconnection between mind and body (Wolman, 2001). Mindfulness pertains to attention to bodily processes and devotion to activities and attitudes that increase the quality of life through improvement of physical and psychological health, such as conscious eating, regular meditation with focused breathing, and exercise like yoga or tai chi. High scorers on this factor may use a variety of foods to energize themselves or alter their internal physical state to ensure optimal psychophysiological functioning. They also tend to feel connected with and seek the company of others as an opportunity to share ideas and concerns. Individuals who score low on Mindfulness usually do not intentionally spend time contemplating or self-reflecting. They may do exercises or relaxation techniques but do not connect these activities to transcendent contexts of meaning. They

usually are not attentive to or concerned with the foods they eat or the physical status of their bodies. These people have lower needs to feel connected to others and tend to be comfortable being on their own.

*Extrasensory Perception.* The Extrasensory Perception factor involves a range of experiences and alternative ways of knowing about the self and its relation to the world (Wolman, 2001). This factor is concerned with the “sixth sense” or paranormal psychic events and experiences ranging from receiving phone calls from someone “just as I was thinking about them” to out-of-body or near-death experiences. People scoring high on this factor show a range of psychic awareness that includes knowledge outside conventional ways of knowing, whereas low scorers tend to use their intellect and capacity for new knowledge in conventional, pragmatic, but often very effective ways. High scorers may report sensing the presence of loved ones who passed away and having conversations with them, having near-death and out-of-body experiences, and believing in the existence of past lives.

*Community.* The fourth factor, Community, captures the concept of group and is defined by the presence of and concern for others (Wolman, 2001). This factor covers social activities that include peers or activities that are on a volunteer and charitable nature. Individuals who score high on this factor tend to be involved with a variety of social activities, charitable organizations, and give time and energy generously to the needy, the chronically ill, homeless shelters or beautification projects. They often attend religious services, consult with clergy or

spiritual leaders, participate in classes, workshops, and conferences or are spiritual community members themselves. Lower scores on the community factor do not mean the person is isolated or indifference to the existence of others. Many low scorers are very gregarious and outgoing, but the difference is that the sense of connection they feel is based more on sociability and culture than on a desire to reach out to help and nurture.

*Intellectuality.* The factor of Intellectuality indicates a desire and commitment to read, study, and discuss spiritual material or sacred texts (Wolman, 2001). It also encompasses the active questioning of traditional teachings of religion. Individuals scoring high on this factor have an interest in and spend much time and energy reading about, discussing, and studying dimensions of spirituality. They like to think about issues associated with spirituality, such as the existence of God or a higher power, the meaning and purpose of life, the finality of death, the reality of individual souls, and the possibility of the immortality of the soul. Low scorers may be interested in learning and in complex cognitive activities in many areas other than spirituality. They like to comprehend and solve problems with logic and empirical evidence and focus on the concrete here-and-now in a rational and practical approach to the world.

*Trauma.* The sixth factor, Trauma, is often considered as a crisis-oriented stimulus to spirituality (Wolman, 2001). This factor implies the experience of physical or emotional illness in oneself or in a loved one, and it also refers to the actual loss of a loved one through death. A higher score suggests personal



encounters with physical or emotional pain and suffering related to oneself or to someone close. Higher scorers usually have had or have observed more than one episode of significant illness or injury, and they may have had near-death or out-of-body experiences in which the individual leaves his or her body and then returns. Low scorers may be highly sympathetic to the pain of others but report fewer-than-average encounters with these events.

*Childhood Spirituality.* Childhood Spirituality denotes spiritual experiences that occurred during childhood, such as attending religious services or being read books like the Bible or other religious texts by parents or grandparents (Wolman, 2001). High scorers have more frequent and meaningful spiritual activities, such as attending religious services or religious schools early in life, than do low scorers. Individuals with lower scores on this factor may report extensive and deep ethical and moral discussions with family but little or no formal ritual instruction or expression. They also might include religious holidays in their family interactions but view these events with more cultural and ethnic meaning rather than religious or spiritual meaning.

Among these seven factors, divinity, mindfulness, extrasensory perception, and intellectuality were of interest in the present study. In the literature on spirituality and health, similar constructs as the divinity factor, for example, perceived closeness to God (Maton, 1989), have been developed and investigated. Attachment theory provides good reasons for linking a felt connection with God and better health status (Hill & Pargament, 2003). Attachment theorists (Kaufman,

1981; Kirkpatrick, 1995) suggested that people who experience a secure connection with God should also experience greater comfort in stressful situations and greater strength and confidence in everyday life, just as children look to their parents for protection and caring.

Mindfulness was described by Langer and Moldoveanu (2000) as the process of drawing novel distinctions that keep individuals situated in the present and make individuals more aware of the context and perspective of their actions. This process may help an individual to have a greater sensitivity to the environment, be more open to new information, and be able to create new categories for structuring perception and may also enhance the individuals' awareness of multiple perspectives for problem solving. Mindful treatments in the health field have demonstrated positive effects in decreasing adverse health symptoms such as arthritis pain and alcoholism and increasing longevity (Langer, 1989). Grossman, Niemann, Schmidt, and Walach (2004) conducted a meta-analysis on studies of mindfulness-based stress reduction (MBSR), a structured group program employing mindfulness meditation to alleviate suffering associated with physical, psychosomatic and psychiatric disorders. The results of the 20 reports included in the analysis suggested that MBSR may help a broad range of individuals to cope with their clinical and nonclinical problems. A key component of mindfulness is non-judgment, and a mindfulness-based approach would not draw a threat message to a physical ache or pain, in contrast to the anxiety that symptoms evoke in somatizers.

Only a few studies were found that examined the relationship between extrasensory perception and health. Several studies have reported a relationship between paranormal beliefs and negative emotions (Maller & Lundeen, 1934; Dudley, 1999) or uncertain circumstances producing negative emotions (Padgett & Jorgenson, 1982; Matute, 1994). Dudley and Whisnand (2000) investigated the relationship between paranormal belief, assessed by the Tobacyk's Revised Paranormal Belief Scale (Tobacyk, 1988) and negative emotions, assessed by the Attributional Style Questionnaire (Peterson, Semmel, von Baeyer, Abramson, Metalsky, & Seligman, 1982), among 52 college students and reported a positive association between paranormal beliefs and a depressive attributional style. Callaghan and Irwin (2003) found a relationship between paranormal belief and both the use of avoidant coping and the non-use of task-oriented coping. However, Rogers, Qualter, Phelps, and Gardner (2006) found neither active-coping nor avoidant coping significantly predicted global paranormal belief by conducting multiple regression on paranormal belief scores with predictors of demographics, three sub-types of coping strategy (active-cognitive, active-behavior or avoidant), four sub-types of emotional intelligence (optimism/mood regulation, appraisal of emotions, social skills, and utilization of emotions) and 12 interactions between three types of coping strategy and four types of emotional intelligence. Keinan (1994) indicated that during the Gulf War, residents living in high-stress areas reported higher scores on magical thinking than residents living in low-stress areas.

The intellectuality subscale was designed to assess a desire and commitment to read, study, and discuss spiritual material or sacred texts. No study was found that tested the relationship between intellectuality, as defined by Wolman, and health. Spiritual intelligence, expressed through the intellectuality factor, has been developed and discussed in the literature. For example, Emmons (1999) reviewed the empirical studies in the psychology of religion and spirituality and identified five core characteristics associated with spirituality intelligence: (1) the capacity to transcend the physical and material; (2) the ability to experience heightened states of consciousness; (3) the ability to sanctify everyday experiences; (4) the ability to utilize spiritual resources to solve problem; and (5) the capacity to be virtuous. Noble (2001) conducted a qualitative study with nine adults investigating the significance of spiritual experiences in their psychological development and found growth in five notable areas: (1) a greater understanding of and ability to endure adversity; (2) a conscious rejection of self-destructive attitudes and behaviors; (3) a new-found or renewed ability to recognize and utilize inner resources; (4) an enhanced acuity of feeling, especially compassion and empathy for oneself and others; and (5) a commitment to participate more fully in life.

Wolman (2001) developed the seven-factor spirituality model to capture a broad range of spirituality-related experiences or practices people reported. Some of these factors or similar constructs have been researched in different contexts with health in the past but most have not been thoroughly studied. While these

factors may have different effects on health, other confounding variables may also influence the relationship between spirituality and health.

*Potential confounding variables.* A relationship between religion or spirituality and physical health could be an erroneous inference if a confounder is present; thus, any temporally antecedent variable that is related to both spirituality and physical health but not part of the proposed pathogenic process could serve as a confounder and should be controlled (Powell, Shahabi, & Thoresen, 2003). The confounders could be age, ethnicity, gender, education, disability, and poor health. Women have been found to be more religious or spiritual than men (Mahalik & Lagan, 2001; Reich, 1997; Ozorak, 1996; Ferraro & Koch, 1994; Levin, Taylor, & Chatters, 1994) and religiousness or spiritual seeking was a buffer for women but not for men against loss of sense of control due to poor physical health (Wink, Dillon, & Prettyman, 2007). Age and ethnicity could be confounders because older people (Mystakidou, et al., 2008) and minorities are more likely to be religious or spiritual (Krause, 2008; Ferraro & Koch, 1994; Levin, Taylor, & Chatters, 1994) or use religious coping (Miltiades & Pruchno, 2002). Older participants (65 to 97 years old) are more likely to rely on religious beliefs and practices when coping with stress (Koenig, 1994). Powell, et al., (2003) suggested that disability, poor health, and education were confounders, but the direction of bias may have been influenced by the specific measure of religion or spirituality used. For example, healthier and better educated people are more likely to attend service and live longer (Ider & Kasl, 1997; Lantz et al., 1998), and failure to control for them could

lead to a relationship between church attendance and health that could actually be a relationship between ability to attend church and health. A negative association between prayer or religiosity and education has been reported (Meraviglia, 2002), and studies also found that higher levels of religiosity are associated with better adjustment in less educated participants (Bantha, Moskowitz, Acree, & Folkman, 2007; Poloma & Gallup, 1991). Based on the literature discussed above, confounding variables need to be controlled in studying the link between spirituality and health.

#### Summary of Literature Review

To summarize, religiousness and spirituality have been studied in relation to psychological factors in health for the past decade. Spirituality may promote positive affect and have a positive effect on health; however, clear definitions and validated measurement are required to enhance the quality of research on spirituality and health. One of the major barriers to studying religiousness/spirituality and its effects on health has been the absence of reliable and validated measures for the concept. Religious coping has to be assessed within a broad context concerning personal, social, and situational interpretation of a situation (Pargament, 1997). Multiple dimensions of religiousness and spirituality need to be examined systematically before much can be concluded regarding the role of religion or spirituality on health (Idler et al., 2003). A group of researchers have worked on defining spirituality with latent constructs to reach a broader understanding of spirituality and capture the essential meanings of the spirituality

components. Wolman (2001) developed the Psychomatrix Spirituality Inventory and named seven factors after conducting an exploratory analysis on 80 spirituality-related items: divinity, mindfulness, extrasensory perception, community, intellectuality, trauma, and childhood spirituality. Only a few studies using the Psychomatrix Spirituality Inventory have been published, and none of them has examined the effects of these spirituality factors on health. Nemeroff (2005) adopted the Psychomatrix Spirituality Inventory for measuring participants' spirituality in her study of psychological factors related to perceived symptoms and immune response to a bogus viral challenge.

*Nemeroff's Study and Effect of Beliefs on Physical Symptoms*

Nemeroff (2005) designed her study based on the viral challenge paradigm; however, she altered it by administering a bogus virus to participants. Nemeroff hypothesized that participants' beliefs about receiving the cold virus would lead to developing cold symptoms due to the nocebo effect. The placebo effect is a universal phenomenon that is defined as the response of a participant to a substance or to any procedure known to be without any therapeutic effect for the specific condition being treated, and nocebo is the phenomenon opposite to placebo (Amanzio & Benedetti, 1999). The nocebo effect is caused by expectations of sickness (or death) and by associated emotional states (Hahn et al., 1997). In other words, "placebo effects" refers to the positive effects of pharmacologically inert compounds, and "nocebo effects" stands for the inverse result that occurs when inert compounds evoke negative health consequences.

Nemeroff's study investigated whether "magical contagion beliefs" about the source of a cold virus could produce measurable effects on perceived symptoms. The participants were randomly assigned to one of the three manipulation groups, in which they were told the virus was from a firefighter, viral bank, or a recently released ex-convict, during the bogus viral administration. The participants were ostensibly exposed to rhinovirus but actually received saline nasal drops for the viral challenge. The data for the current study were collected as part of the larger study conducted by Nemeroff. The present study investigated the moderation effects of divinity, mindfulness, extrasensory perception, and intellectuality on stress measured by cortisol levels and the perceived symptoms induced by the bogus viral challenge. Under the assumptions of magical contagion, Nemeroff expected that participants in the ex-convict group would develop more cold symptoms than participants in the firefighter and viral bank groups. Magical contagion, a principle of thinking common in traditional societies, describes the transfer of properties from a source to a recipient through contact, and the harmfulness of the contagious entity depends on the nature of the relationship between source and recipient (Nemeroff & Rozin, 2000; Nemeroff, 1995). However, magical contagion is not relevant to the current study. In order to avoid the complex effects due to different groups, only participants in the ex-convict group were selected to test the moderation effects of spirituality in the present study.



### *Purpose of This Study*

The current study used Nemeroff's data set described above to address several under-investigated research questions. The first purpose was to test the validity of four factors of Psychomatrix Spirituality Inventory, divinity, mindfulness, extrasensory perception, and intellectuality presented in Figure 1, by using confirmatory factor analysis (CFA; Hu & Bentler, 1995). This scale was developed by Wolman (2001) who pilot tested it with 714 individuals who were taking part in conferences oriented toward and focused on mind/body awareness, healing, spirituality practices, and consciousness and self-empowerment. Seven factors emerged from Wolman's statistical analysis: Divinity, Mindfulness, Extrasensory Perception, Community, Intellectuality, Trauma, and Childhood Spirituality. Furthermore, Wolman (R. N. Wolman, personal communication, March 28, 2008) indicated that the PSI was administered to over 7000 individuals with diverse background and six factors were concluded in the most recent analysis. Nemeroff and her research team adopted the earlier version of PSI, which contained the same items for the divinity, mindfulness, extrasensory perception and intellectuality subscales. They collected data for the cold study from both undergraduate students and community members. The first purpose of the current research was to test the validity of these four factors/subscales, using confirmatory factor analysis.

The second purpose of the present study was to investigate the moderation effects of divinity, mindfulness, extrasensory perception and intellectuality on

stress, assessed by cortisol level, and on perceived cold symptoms, induced by the bogus cold viral challenge. A positive effect of divinity on relieving stress and reducing cold symptoms was expected. induced by the bogus cold viral challenge. Psychological research in mindfulness has primarily focused on the effects of mindfulness-based interventions, usually as part of a clinical treatment package, and less on understanding the meaning and expression of mindfulness itself (Brown, Ryan & Creswell, 2007). The mindfulness subscale developed by Wolman measured attention to bodily processes and devotion to activities and attitudes that increase the quality of life through improvement of physical and psychological health; therefore, a buffering effect on stress was also expected in the present study. In the present study, the viral challenge was supposed to be a stressful and uncertain circumstance, and participants who reported higher extrasensory perception experiences were expected to have lower susceptibility to cold symptoms. A person who is more interested in spiritual matters, that is seeking the meaning of life, may also benefit from the growth Noble (2001) suggested; therefore, a protective effect of intellectuality was hypothesized in terms intellectuality buffering stress and resulting in better adjustment.

In the present study, gender, age, ethnicity, and population (undergraduate student versus community member) were controlled as confounders in the analyses of moderation effects of spirituality factors in relation to health. Health and disability might not be confounders because all participants were screened for

medications and cold symptoms before enrollment. Based on the literature, five hypotheses were posed.

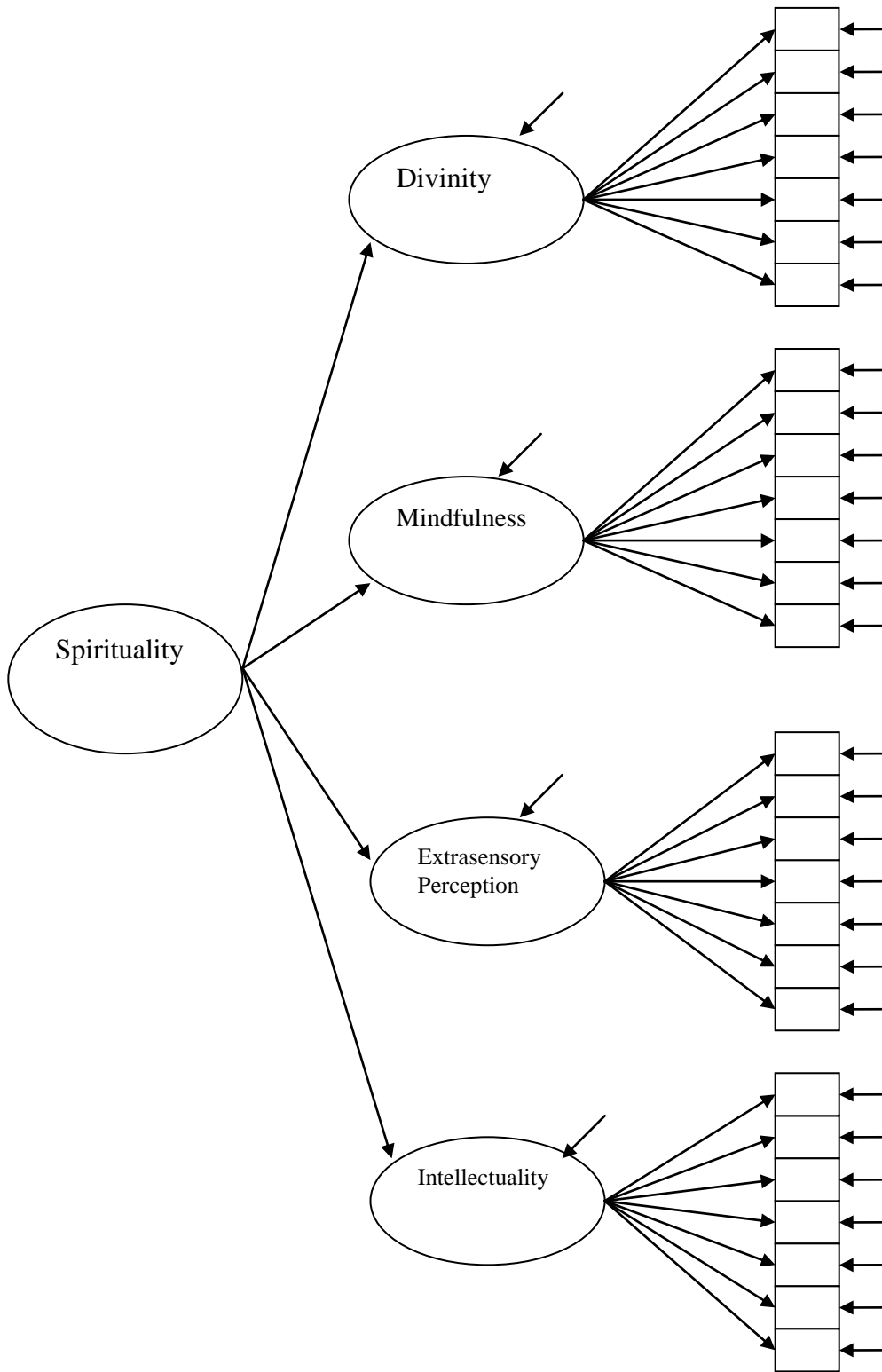


Figure 1. Four-factor model of spirituality

### *Hypotheses*

H1: It was anticipated that the four factors, divinity, mindfulness, extrasensory perception and intellectuality, of Psychomatrix Spirituality Inventory would be confirmed.

H2: Divinity will moderate the effect of stress, assessed by cortisol level, on physical symptoms induced by the bogus cold viral challenge after controlling for gender, age, ethnicity, and participant status (student versus community), such that the relationship between stress and cold symptoms decreases as divinity increases. In other words, the higher the divinity score is, the fewer (or less severe) cold symptoms the participants will develop or experience post viral exposure.

H3: Mindfulness will moderate the effect of stress, assessed by cortisol level, on physical symptoms induced by the bogus cold viral challenge after controlling for gender, age, ethnicity, and participant status (student versus community), such that the relationship between stress and cold symptoms decreases as mindfulness increases. In other words, the higher the mindfulness score is, the fewer (or less severe) cold symptoms the participants will develop or experience post viral exposure.

H4: Extrasensory perception will moderate the effect of stress, assessed by cortisol level, on physical symptoms induced by the bogus cold viral challenge after controlling for gender, age, ethnicity, and participant status (student versus community), such that the relationship between stress and cold symptoms decreases as extrasensory perception increases. In other words, the higher the

extrasensory perception score is, the fewer (or less severe) cold symptoms the participants will develop or experience post viral exposure.

H5: Intellectuality will moderate the effect of stress, assessed by cortisol level, on physical symptoms induced by the bogus cold viral challenge after controlling for gender, age, ethnicity, and participant status (student versus community), such that the relationship between stress and cold symptoms decreases as intellectuality increases. In other words, the higher the intellectuality score is, the fewer (or less severe) cold symptoms the participants will develop or experience post viral exposure.

## Chapter 2

### Method

#### *Recruitment and Procedures*

Data for the current study were collected as part of a larger National Institutes of Health funded study that investigated nocebo and placebo responses in relation to contagion via a bogus viral cold challenge paradigm (Nemeroff, 2005). All procedures and materials were approved by Arizona State University's Institutional Review Board. Undergraduate students read fliers or sign-up sheets describing a study on "Factors influencing resistance to the common cold" posted in the Psychology Department at ASU. Community members were recruited by advertisements posted in three local newspapers. The fliers and advertisements informed participants that participation in this study involved exposure to "nothing more serious than" a mild rhinovirus, the type of virus that could cause the common cold. Participants were told that they were likely to experience symptoms of a cold but that no serious health risk was involved.

Volunteers were screened by phone for symptoms of allergies, colds, or flu and then scheduled for two lab sessions. If the participants were having any such symptoms the night before their first lab visit, they were asked to reschedule their intake. During the first lab session, the researchers reconfirmed the participants' eligibility to participate and briefly described the study, including the cover story that participants would be exposed to a viral challenge with rhinovirus, a virus that causes the common cold; thus, factors affecting susceptibility to illness could be studied. After the participants signed the consent form (see Appendix A), which

was carefully worded to present relevant risk and procedural information accurately and did not contain any actual misinformation, they filled out questionnaires including a symptom checklist (see Appendix B). The researcher explained the supposed isolation and purification procedures involved in harvesting the cold virus to alleviate any possible concerns about more serious infection, such as HIV. The researcher collected baseline saliva samples before administering the nose drops that supposedly contained the virus but which were actually sterile saline drops. The researcher collected the second saliva sample from the participants approximately 15 minutes after the administration of the nasal drops. The participants self-monitored at home for 3 days and returned to the lab on the fourth day post “exposure.” The participants filled out the symptoms checklist at 9 p.m. on the same day as exposure, and at 1 p.m., 5 p.m. and 9 p.m. on the following three days. During the three-day period, the participants also collected a saliva sample once a day at the same time as the original sample collection. At the second lab session, participants filled out a questionnaire including the Psychomatrix Spirituality Inventory (see Appendix C) before the researcher debriefed them about the bogus nature of the virus and the rationale for the study. Participants were urged not to discuss this study with anyone until data collection was completed.

### *Participants*

*Hypothesis 1.* A total sample of 265 cases with complete data on the four factors, divinity, mindfulness, extrasensory perception, and intellectuality, were



included in the confirmatory factor analysis. The demographic information, including gender and ethnicity, is presented in Table 1.

Table 1

*Demographic Information of Confirmatory Factor Analysis (n=265)*

	Male		Female		Total	
	f	%	f	%	f	%
Gender	126	48	134	51		
Ethnicity						
Caucasian	91	73	100	75	192	74
Hispanic	12	10	17	13	29	11
Asian	4	3	5	4	9	4
Black	8	6	7	5	15	6
Native American	5	4	3	2	8	3
Other	5	4	2	2	7	2
Missing					5	2

*Hypothesis 2, 3, 4, and 5.* The participants for the second purpose of the present study are 102 adults (47 male, 53 female, and 2 did not report gender).

About 35% ( $n = 35$ ) are undergraduate students recruited from Psychology 101 classes at Arizona State University and 67 % ( $n = 67$ ) are community members. The mean of age was 30.51 ( $SD = 13.02$ ) years. Undergraduate students received \$50 and 2 research participation credits, and community members received \$125 for participation. Among the 102 participants who met the inclusion criterion, 80 had complete data for the Psychomatrix Spirituality Inventory, 65 had complete data for perceived cold symptoms and 47 had complete data on all observed variables. Seventy percent ( $n = 71$ ) of participants were Caucasian, 7% ( $n = 7$ ) were Hispanic, 6% ( $n = 6$ ) were Asian and Pacific Islanders, 9% ( $n = 9$ ) were Black or African Americans, 3% ( $n = 3$ ) were Native American, and 4% ( $n = 4$ ) were other ethnic groups. Demographic information of total participants and break down for male and female was presented in Table 2.

Table 2

*Demographic Information of Moderation Effects Analysis (n = 100)*

	Male		Female		Total	
	f	%	f	%	f	%
Gender	47	47	53	53	100	100
Ethnicity						
Caucasian	32	70	38	72	71	71
Hispanic	3	6	4	8	7	7
Asian	2	4	4	8	6	6
Black	4	9	5	9	9	9
Native	3	7	0	0	3	3
American						
Other	2	4	2	4	4	4
Participant						
status						
Student	11	23	23	43	35	34
	36	77	30	57	67	66
Community						

### *Instrumentation*

*Psychomatrix Spirituality Inventory.* PSI is a self-reported 80-item measure on a 4-point likert scale. An earlier version of PSI (79 items) was used in the present study. Four seven-item subscales, divinity, mindfulness, extrasensory perception, and intellectuality, were scored separately. Participants were asked to give a sincere response to each statement on a scale ranging from 1 (never) to 4 (almost always). For example, one item of mindfulness subscale states, “I set aside time for contemplation and self-reflection.” The total score for each subscale can range from 7 to 28, and a higher score indicates higher divinity, mindfulness, extrasensory perception, or intellectuality. Reliability levels estimated in Wolman’s study among 4737 respondents for the four factors were .87 for the divinity, .80 for the mindfulness, .79 for the extrasensory perception, and .68 for the intellectuality (Matthews, 2004). In the present study, the internal consistency coefficient was .88 for the divinity subscale, .80 for the mindfulness subscale, .70 for the extrasensory perception subscale, and .73 for the intellectuality subscale based on 265 participants.

*Physical symptom checklist.* The outcome variable, perceived symptoms, was measured by a brief symptom checklist, that was developed based on the typical symptoms assessed in Cohen’s paradigm. The checklist assessed for presence of symptoms including fever, body aches/pains, runny nose, nasal congestion, sneezing, sinus pressure, earache, nausea/vomiting, diarrhea, upset

stomach, fatigue, dizziness, itchy/watery eyes, bloody nose, chest congestion, cough, sore throat, headache, stiff neck, swollen glands, wheezing, post-nasal drip, chills, trouble sleeping, trouble concentrating, general malaise (feeling “down”), loss of appetite, and an open-ended item to allow listing of any other physical symptoms being experienced. Symptoms were rated on a scale ranging from 1 (not at all) to 5 (extremely). The total score can range from 27 to 135 or above if other symptoms were specified, and a higher score indicates more severe physical symptoms. In the present study, average scores of the total 12 repeated symptoms measures at different time points within five days were used for analysis.

*Saliva sample.* Cortisol was assessed using the saliva sample. Participants provided five saliva samples during the course of the study: Prior to viral exposure, 15 minutes post viral exposure, and the same time as initial viral exposure on each of the three following days. Samples were collected with small sampling vials. The participants held the vials close to their mouths and passively allowed their saliva to drain into the vials via small straws. Sample collection and handling procedures were dealt in consultation with Douglas A. Granger, Ph.D., (Associate Professor, Pennsylvania State University; Director, Pennsylvania State University Behavioral Endocrinology Laboratory; President, Salimetrics), and all assays were conducted by Salimetrics using a high-sensitivity enzyme immunoassay. The test had a range of sensitivity from .007 to 1.2 ug/dl with a higher score indicating higher stress, and average intra-and inter-assay coefficients of variation were 4.13% and 8.89%, respectively.

Sample collections were scheduled at least one hour after consumption of a major meal. Participants were asked to rinse their mouths with water prior to sample collection in order to decrease the potential for contamination associated with foods that alter the acidity level of saliva or foods that cause increased bacterial growth. A health screen was conducted to avoid blood contamination; the screen included questions related to oral health and recent oral injuries or problems. No milk or dairy products were consumed for 30 minutes before sample collection to avoid the potential for cross-reaction with bovine hormones, and alcohol use was restricted 24 hours before sample collection as alcohol respired into saliva interferes with immunoassay. In the lab, saliva samples were frozen at -20°C immediately after collection and mailed overnight on dry ice to Salimetrics, Inc. (State College, PA; affiliated with Pennsylvania State University's Behavioral Endocrinology Laboratory). Among all five saliva samples collected at different times, the median time point on the second day evening post exposure was selected for measuring cortisol level.

#### *Data Analysis Plan*

Confirmatory factor analysis (CFA) is a theory-driven technique. The researcher used a hypothesized model to estimate a population covariance matrix which was compared with the observed covariance matrix. The researcher minimized the difference between the estimated and observed matrices technically (Schreiber, Stage, King, Nora, & Barlow, 2006). A confirmatory factor analysis was conducted on four subscales of this inventory, divinity, mindfulness,

extrasensory perception, and intellectuality, using the data collected by Nemeroff and her research team. The results of confirmatory factor analyses were examined to see if they confirm these four factors Wolman (2001) concluded. The 79-item Psychomatrix Spirituality Inventory used by Nemeroff was slightly different from the 80-item inventory published by Wolman. A total of 28 items were selected for the confirmatory factor analysis based on the same items Wolman chose for scoring these four subscales. The theoretical CFA model is presented in Figure 1. The latent variables were the four factors Wolman proposed. Each latent variable, divinity, mindfulness, extrasensory perception, and intellectuality was measured with seven items.

The present study also investigated the moderation effects of divinity, mindfulness, extrasensory perception, and intellectuality on stress and perceived physical symptoms induced by the bogus cold viral challenge among college students and local community members. Regression analyses were conducted using SPSS version 17 (SPSS, 2008). Based on the methodological guidelines for testing moderator effect (Baron & Kenny, 1986; Frazier, Tix, & Barron, 2004), continuous predictors and moderators were centered to eliminate potential multicollinearity, with dichotomous measures subjected to effects coding, prior to being entered into regression analysis. Variables were entered into regression in 3 steps. To factor out possible demographic confounders, gender, age, ethnicity, and population (student versus community) were entered in Step 1. The dependent variable, perceived cold symptoms was hierarchically regressed onto the

independent variable, cortisol level in Step 2. And then the spiritual factor (divinity, mindfulness, extrasensory perception, or intellectuality) and the interaction between cortisol level and spiritual factor were entered into Step 3 to test the moderation effect of spiritual factor on stress.



## Chapter 3

### Results

#### *Initial Data Screening*

*Estimating missing data.* Prior to analysis, gender, age, ethnicity, four factors of psychomatrix spirituality inventory (divinity, mindfulness, extrasensory perception, and intellectuality), and cortisol level were examined using SPSS for accuracy of data entry, missing values, and fit between their distributions and the assumptions of confirmatory factor analysis and multivariate analysis. Missing data were analyzed using the SPSS Missing Values Analysis (MVA) program. The missing rate of several variables, perceived cold symptoms, divinity, mindfulness, extrasensory perception, and intellectuality is larger than 5%; therefore, pattern of missing values were examined. The Little's MCAR test of whether the data are missing completely at random (Tabachnick & Fidell, 2007) indicated that the probability that the pattern of missing diverges from randomness is greater than .05 ( $p = .21$ ), so that missing completely at random may be inferred. In the confirmatory factor analysis, listwise deletion was applied for handling missing data. After dropping participants without complete data on the four subscales of Psychomatrix Spirituality Inventory, divinity, mindfulness, extrasensory perception and intellectuality, 265 participants were included in the confirmatory factor analysis. However, data imputation was applied for variables with a missing rate larger than 5% in analysis of moderation effect testing because listwise deletion results in a lack of statistical power for multiple regression analysis. Regression was adopted to impute missing data, because it is a more sophisticated method than

inserting the grand mean (Tabachnick & Fidell); cases with complete data generate the regression equation and then the equation is used to predict missing values for incomplete cases. The advantage to regression is that it is more objective than the researcher's guess, but the regression method also has disadvantages. One disadvantage is that the scores fit together better than they should and the missing value is likely to be more consistent with other variables than a real score is. A second disadvantage is the reduction in variance because the estimate could be too close to the mean. A third disadvantage is the requirement of good independent variables as good predictors in the dataset; otherwise, the estimate from regression is about the same as inserting the mean. Statistical significance was set at 0.05 (2-tailed) for statistical tests. Power was determined using G\*Power (Erdfelder, Faul, & Buchner, 1996). A power of .90 was achieved with a sample size of 99, alpha of .05 and 3 independent variables in the multiple regression analysis for moderation effects testing after missing data were estimated.

*Detecting outliers and ensuring normality.* All variables were screened using graphical and statistical methods to ensure that all measures were normally distributed and linear. Potential univariate outliers were detected among spirituality variables, which are cases with standardized scores in excess of 3.3 ( $p < .001$ , two tailed test) (Tabachnick & Fidell, 2007). A log transform is recommended when psychometric functions on a linear-stimulus dimension are related to one another by multiplicative factor of the stimulus scale because log transform will normalize these functions such that they are parallel with a constant

effective range (Saber, 1995). Due to the positive skewness of scores on the cortisol measure, a base 10 logarithmic transformation was applied to provide the best approximation of a normal distribution. However, graphical display of the data presents non-transformed values for ease of interpretation. After log transformation, the skewness of cortisol level was reduced from 3.65 to 0.25 and the kurtosis was reduced from 16.88 to 0.25. The screening process revealed that no outlier was found for the divinity, mindfulness, extrasensory perception, and intellectuality variables. For cortisol level, outlier was defined as approximately eight standard deviations above the mean (Tartaro, Luecken, & Gunn, 2005), and no outlier was found. By omitting one outlier from the perceived cold symptoms measure, skewness of cold symptoms was reduced from 3.74 to 2.36. Screening for multicollinearity was conducted with the criteria of a conditioning index  $> 30$  coupled with variance proportions  $> .50$  for at least two different variables in SPSS collinearity diagnostics table (Tabachnick & Fidell, 2007), and no multicollinearity was evident. Means, standard deviations, correlations, skewness and kurtosis of all variables before missing data imputation are presented in Table 3, and data after missing imputation are presented in Table 4.

Table 3

*Means, Standard Deviations, and Correlations of Studied Variables before Imputing Missing Data (n = 47)*

	<i>M</i>	<i>SD</i>	<i>SK</i>	<i>KU</i>	1	2	3	4	5	6	7	8
1. Age	30.51	13.02	.76	-.74	1.00							
2. Gender	-	-	-	-	-	1.00						
3. Divinity	2.52	.82	-.29	-.70	.15	.35**	1.00					
4. Mindfulness	2.17	.62	.69	-.26	.11	.16	.49**	1.00				
5. Extrasensory perception	1.94	.55	.18	-.60	.06	.31**	.60**	.55**	1.00			
6. Intellectuality	2.38	.59	.03	.23	.01	.09	.46**	.57**	.45**	1.00		
7. Cortisol levels	.16	.21	0.37	0.25	-.15	.07	-.07	-.07	-.07	-.07	1.00	
8. Cold symptoms	1.20	.31	4.02	21.02	-.04	.41**	.14	.25	.16	.17	.24	1.00

*Note.* SK = skewness, KU = kurtosis, \* $p < .05$ , \*\* $p < .01$

Table 4

*Means, Standard Deviations, and Correlations of Studied Variables after Imputing Missing Data (n = 100).*

	<i>M</i>	<i>SD</i>	SK	KU	1	2	3	4	5	6	7	8
1. Age	30.51	13.02	.76	-.74	1.00							
2. Gender	-	-	-	-	-	1.00						
3. Divinity	2.51	.74	-.28	-.18	.12	.33**	1.00					
4. Mindfulness	2.16	.55	.79	.47	.09	.16	.47**	1.00				
5. Extrasensory perception	1.93	.48	.22	.11	.05	.28**	.59**	.52**	1.00			
6. Intellectuality	2.38	.53	.04	1.06	.01	.07	.42**	.54**	.41**	1.00		
7. Cortisol levels	.15	.21	0.37	0.25	-.15	.08	-.04	-.03	-.04	-.05	1.00	
8. Cold symptom	1.19	.22	2.36	6.65	-.00	.32**	.04	.11	.16	.04	.19	1.00

*Note.* SK = skewness, KU = kurtosis, \* $p < .05$ , \*\* $p < .01$

*Demographic and descriptive statistics.* Demographic information of total participants and break down for male and female was presented in Table 2, including the number and percentage of gender, ethnicity and participant status. Two participants were dropped due to missing in the gender variable. The sample size for the male and female groups was close to equal. Independent *t*-tests were performed to assess differences between men and women on the major study variables. No significant gender differences were found in age ( $p = .90$ ), salivary cortisol levels ( $p = .75$ ), mindfulness ( $p = .13$ ), and intellectuality ( $p = .47$ ).

### *Test of H1: Confirmatory Factor Analysis*

Participants with complete data were included in the analyses. EQS 6.0 was used to conduct the confirmatory factor analyses (CFA). Maximum likelihood estimated was adopted, and raw data was input into an EQS file for analyses. A two-step procedure recommended by Anderson and Gerbing (1988) was adopted to conduct the CFA. An overall measurement model in which four latent variables were allowed to correlate was tested in the first step. The loading of the first indicator for each latent variable was fixed to one to minimize the number of parameters estimated in the model (Schreiber et al., 2006). In the second step, a second-order structural model with one factor and four latent variables was tested. Maximum likelihood method was used for estimation, and raw data were input into an EQS file for analyses. The fit of these models was evaluated using Chi-square goodness-of-fit, the comparative fit indices (CFI), the normed fit index (NFI) the root mean square of error approximation (RMSEA). An adequate model fit is obtained if the NFI and CFI are  $> 0.90$  and the RMSEA is  $\leq 0.08$ , and a good model fit is obtained when the NFI and CFI are  $> 0.95$  and the RMSEA is  $\leq 0.06$  (Hu & Bentler, 1999).

*Measurement model testing.* The overall measurement model did not provide adequate or good fit to the data; Chi-square = 936.36 based on 344 degree of freedom ( $p < .001$ ). Model AIC = 248.36. The comparative fit index (CFI) = .82, the standardized RMR = .08 and the RMSEA = .08. A Lagrange multiplier (LM) test was conducted; however, adding the parameters suggested would result in difficulties in interpretation. Therefore, the initial measurement model was identical to the final measurement model.

*Structural model testing.* Mean scores, standard deviations, factor loadings for the four factors, and interfactor correlations of the four-factor model are presented in Table 5. The overall four factor structural model did not provide adequate or good fit to the data either; Chi-square = 957.50 based on 346 degree of freedom ( $p < .001$ ). Model AIC = 265.50. The comparative fit index (CFI) = .82, the standardized RMR = .08 and the RMSEA = .08. These values did not indicate a fit between the model and the observed data. The results of this analysis did not support the first hypothesis.



Table 5

*Mean Scores, Standard Deviations, Factor Loadings for Latent Variables, and Interfactor Correlations from the Four-factor Model (n=265)*

	M (SD)	Factor	1	2	3	4
		loading				
1. Divinity	2.49 (.88)	.90*	1.00			
2. Mindfulness	2.16 (.64)	.70*	.54**	1.00		
3. Extrasensory perception	1.88 (.57)	.83*	.65**	.50**	1.00	
4. Intellectuality	2.30 (.65)	.91*	.63**	.61**	.51**	1.00

*Note.* Participants responded to each statement on a 4-point scale (1 = never, 4 = almost always). \* $p < .05$ ; \*\* $p < .01$ .

#### *Regression Analyses*

Data analysis proceeded in several steps. Correlations had been calculated between divinity, mindfulness, extrasensory perception, and intellectuality, the cortisol levels on the next day of the exposure to bogus virus and the cold symptoms were presented in Table 1. All continuous independent variables, cortisol level, divinity, mindfulness, extrasensory perception, and intellectuality were centered prior to creating interaction terms by converting to deviation scores so that each variable had a mean of zero in the analyses of testing the moderation effect (Aiken & West, 1991). The predictor for interaction was formed by multiplying these two independent centered variables. Aiken and West suggested

that each of the predictor variables should be centered to maximize interpretability and to minimize problems of multicollinearity for testing the interaction effects. Analyses with centered variables would not affect unstandardized regression coefficients for simple terms in the equation, and the significant test for the interaction also remains the same, although the standardized regression coefficients are different for all effects (Tabachnick & Fidell, 2007). Hypotheses of moderation effects were tested with multiple regression analyses as has been done in previous studies, which examined moderator effects and simulation studies have demonstrated that hierarchical multiple regression procedures that maintain the true nature of continuous variables result in fewer Type I and Type II errors for detecting moderator effects (Frazier, Tix, & Barron, 2004). All confounding variables, including gender, ethnicity, and participant status (student versus community), were dummy coded before entering into the equations, and age was remained as a continuous variable. For independent variables, cortisol level and spiritual factors were continuous. The potential loss of statistical power from using bivariate subgroup analysis can be prevented by including categorical and continuous variables in the same multivariate analysis (Cohen, 2003). Furthermore, researchers can obtain all of the detailed partitioning effects of variables without the necessity of multiplications and danger of omitting some paths by entering each variable in order of causal priority (Cohen, 2003).

*H2: Divinity would moderate the effect of stress.* A hierarchical multiple regression analysis was conducted to evaluate the moderating effect of divinity on

stress after controlling for demographics. Inclusion of the gender, age, ethnicity, and participant status (student versus community) measures alone accounted for 15.1% of the total variance in cold symptoms, and the initial model was not statistically significant,  $F(8, 90) = 2.0, p = .06$ . In the second step, inclusion of divinity and cortisol level added 4.0% more variance in cold symptoms, and the second model was statistically significant,  $F(10, 88) = 2.04, p < .05$ . Gender ( $\beta = .28, t = 2.60, p = .01$ ) is a statistically significant predictor and cortisol levels ( $\beta = .21, t = 1.97, p = .05$ ) is very close to the statistically significant level for predicting cold symptoms. In the final model, inclusion of interaction between divinity and cortisol level only explained 0.1% more variance in cold symptoms, and the final model was not statistically significant,  $F(11, 87) = 1.97, p < .05$ . These results suggest that there was no moderating effect of divinity on the relationship between stress and cold symptoms. The second hypothesis that divinity would moderate the effect of stress was not supported. Table 6 presents the final hierarchical model for predicting cold symptoms showing  $R^2, \Delta R^2$  for all steps in regression, and standardized regression coefficients for all predictor measures.

Table 6

*Moderation of Divinity on Stress (cortisol level) and Cold Symptoms (n=100)*

Step	Predictor	$R^2$	$\Delta R^2$	$\beta$	$t$	$p$
1	Female <sup>a</sup>	.15		.26	2.43	.02*
	Age			.16	1.28	.20
	Hispanic <sup>b</sup>			-.07	-.72	.48
	Asian <sup>c</sup>			.01	.12	.90
	Black <sup>d</sup>			-.13	-1.34	.20
	Native American <sup>e</sup>			-.07	-.70	.49
	Other <sup>f</sup>			-.09	-.91	.37
	Population <sup>g</sup>			.15	1.25	.21
2	Cortisol level	.19	.04	.22	2.03	.05
	Divinity			-.75	-1.12	.27
3	Cortisol*Divinity	.20	.01	-.73	-1.08	.28

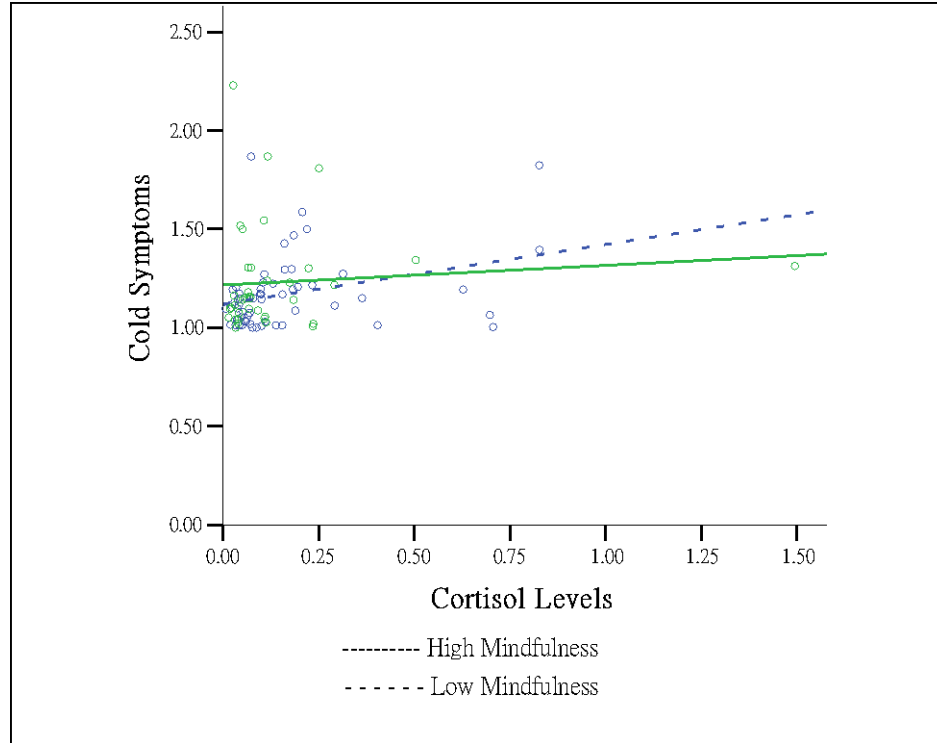
*Note.* \* $p < .05$ .

<sup>a</sup>Male is used as a reference group; <sup>b</sup>Caucasian is a reference group = Caucasian;

<sup>c</sup>Caucasian is a reference group; <sup>d</sup>Caucasian is a reference group; <sup>e</sup>Caucasian is a reference group; <sup>f</sup>Caucasian is a reference group; <sup>g</sup>0 = community, 1 = student.

*H3: Mindfulness would moderate the effect of stress. A hierarchical multiple regression analysis was conducted to evaluate the moderating effect of mindfulness on stress after controlling for gender, age, ethnicity, and participant*

status (student versus community). The demographic measures accounted for 15.1% of the total variance in cold symptoms, and the initial model was not statistically significant,  $F(8, 90) = 2.0, p = .06$ . In the second step, inclusion of mindfulness and cortisol level added 4% more variance in cold symptoms, and the second model was statistically significant,  $F(10, 88) = 2.03, p < .05$ . The interaction between mindfulness and cortisol level was entered into the final model, and the interaction predicted significantly over and above other measures,  $\Delta R^2 = .05, F(11, 87) = 2.45, p = .01$ . Gender ( $\beta = .27, t = 2.58, p = .01$ ) and cortisol levels ( $\beta = .22, t = 2.00, p = .049$ ) are statistically significant predictors for cold symptoms. In this final model, mindfulness appears to significantly predict cold symptoms ( $\beta = -1.21, t = -2.29, p < .05$ ) and there was a statistically interaction effect of cortisol level and mindfulness on cold symptoms ( $\beta = -1.25, t = -2.36, p < .05$ , see figure 2).



*Figure 2.* The interaction of cortisol levels and mindfulness.

Based on these results, the mindfulness measure appeared to predict cold symptoms, and it also interacted with cortisol level in predicting cold symptoms. Women appeared to be more susceptible to developing cold symptoms after being exposed to the virus. The third hypothesis that mindfulness would moderate the effect of stress was confirmed. Results for the final model are presented in Table 7, including  $R^2$ ,  $\Delta R^2$  for all steps in regression, and standardized regression coefficients,  $t$  values and  $p$  values for all predicting variables.

Table 7

*Moderation of Mindfulness on Stress (cortisol level) and Cold Symptoms (n=100)*

Step	Predictor	$R^2$	$\Delta R^2$	$\beta$	$t$	$p$
1	Female <sup>a</sup>	.15		.27	2.69	.01*
	Age			.15	1.26	.21
	Hispanic <sup>b</sup>			-.04	-.45	.65
	Asian <sup>c</sup>			.01	.09	.93
	Black <sup>d</sup>			-.18	-1.82	.07
	Native American <sup>e</sup>			-.06	-.60	.55
	Other <sup>f</sup>			-.09	-.91	.37
	Population <sup>g</sup>			.15	1.27	.21
2	Cortisol level	.19	.04	.20	1.62	.06
	Mindfulness			-1.21	-2.29	.03*
3	Cortisol*Mindfulness	.24	.05	-1.25	-2.36	.02*

*Note.* \* $p < .05$ .

<sup>a</sup>Male is used as a reference group; <sup>b</sup>Caucasian is a reference group = Caucasian;

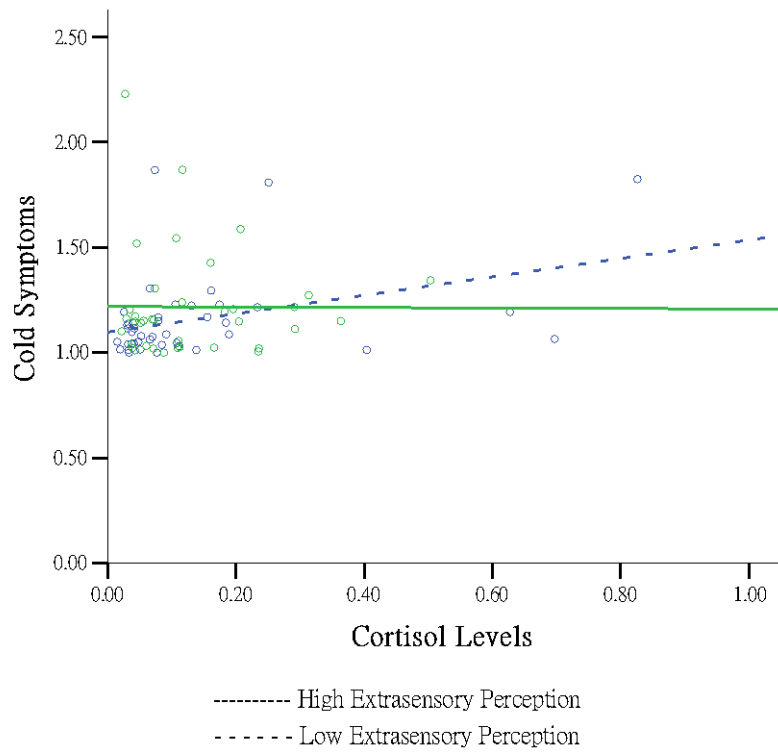
<sup>c</sup>Caucasian is a reference group; <sup>d</sup>Caucasian is a reference group; <sup>e</sup>Caucasian is a reference group; <sup>f</sup>Caucasian is a reference group; <sup>g</sup>0 = community, 1 = student.

*H4: Extrasensory perception would moderate the effect of stress. A*

hierarchical multiple regression analysis was conducted to evaluate the moderating effect of mindfulness on stress after controlling for gender, age, ethnicity, and participant status (student versus community). The demographic measures accounted for 15.1% of the total variance in cold symptoms, and the initial model was not statistically significant,  $F(8, 90) = 2.0, p = .06$ . In the second step, extrasensory perception and cortisol levels were entered into the equation. The second model was statistically significant,  $F(10, 88) = 2.04, p < .05$ , and these extrasensory perception and cortisol levels explained 4% more variance in cold symptoms. Gender appears to significantly predict cold symptoms ( $\beta = .26, t = 2.50, p < .05$ ). The interaction between extrasensory perception and cortisol level was entered into the final model, and the results of this analysis indicated that this interaction predicted cold symptoms over and above previous entered measures,  $\Delta R^2 = .04, F(11, 87) = 2.40, p = .01$ . In this final model, extrasensory perception ( $\beta = -1.11, t = -2.14, p < .05$ ) and the interaction between cortisol level and extrasensory perception ( $\beta = -1.15, t = -2.45, p < .05$ , see figure 3) predicted cold symptoms.

These results suggest that extrasensory perception measure moderates cortisol level in predicting cold symptoms, and women are more likely to develop cold symptoms after being exposed to bogus virus. The fourth hypothesis that extrasensory perception would moderate the effect of stress was supported. Table 8 demonstrates the results for the final hierarchical regression model.





*Figure 3.* The interaction of cortisol levels and extrasensory perception.

Table 8

*Moderation of Extrasensory Perception on Cortisol Levels and Cold symptoms*  
(*n=100*)

Step	Predictor	$R^2$	$\Delta R^2$	$\beta$	$t$	$p$
1	Female <sup>a</sup>	.15		.29	2.75	.01*
	Age			.13	1.08	.28
	Hispanic <sup>b</sup>			-.09	-.87	.39
	Asian <sup>c</sup>			.01	.06	.95
	Black <sup>d</sup>			-.14	-1.48	.14
	Native			-.12	-1.08	.28
	American <sup>e</sup>					
	Other <sup>f</sup>			-.10	-1.09	.28
	Population <sup>g</sup>			.11	.91	.37
2	Cortisol level	.19	.04	.18	1.65	.10
	Extrasensory			-1.11	-2.14	.04*
3	Cortisol*Extra.	.23	.04	-1.15	-2.25	.03*

*Note.* \* $p < .05$ .

<sup>a</sup>Male is used as a reference group; <sup>b</sup>Caucasian is a reference group = Caucasian;  
<sup>c</sup>Caucasian is a reference group; <sup>d</sup>Caucasian is a reference group; <sup>e</sup>Caucasian is a  
reference group; <sup>f</sup>Caucasian is a reference group; <sup>g</sup>0 = community, 1 = student.

*H5: Intellectuality would moderate the effect of stress.* A hierarchical multiple regression analysis was conducted to evaluate the moderating effect of

mindfulness on stress after controlling for gender, age, ethnicity, and participant status (student versus community). The demographic measures accounted for 15.1% of the total variance in cold symptoms, and the initial model was not statistically significant,  $F(8, 90) = 2.0, p = .06$ . Intellectuality and cortisol level were entered into the equation in the second step, and these two measures explained an additional 4% variance in cold symptoms; the second model was statistically significant,  $F(10, 88) = 2.03, p < .05$ . Gender ( $\beta = .27, t = 2.63, p = .01$ ) was a statistically significant predictor and cortisol level almost met the significant statistical level ( $\beta = .21, t = 1.99, p = .05$ ) for predicting cold symptoms. The interaction between intellectuality and cortisol level was entered into the final model, and the final model was statistically significant,  $\Delta R^2 = .03, F(11, 87) = 2.19, p < .05$ . The interaction between intellectuality and cortisol level was not a significant predictor for cold symptoms ( $\beta = -1.16, t = -1.81, p = .07$ ). Gender again appears to significantly predict cold symptoms ( $\beta = .25, t = 2.39, p < .05$ ). These results suggest that intellectuality measure did not moderate cortisol level in predicting cold symptoms, and women are more likely to develop cold symptoms after being exposed to bogus virus. The fifth hypothesis that intellectuality would moderate the effect of stress was not supported. Results of the final hierarchical regression model are presented in Table 9.

Table 9

*Moderation of Intellectuality on Stress (cortisol level) and Cold Symptoms*

(*n*=100)

Step	Predictor	$R^2$	$\Delta R^2$	$\beta$	<i>t</i>	<i>p</i>
1	Female <sup>a</sup>	.15		.25	2.39	.02*
	Age			.15	1.26	.21
	Hispanic <sup>b</sup>			-.07	-.74	.46
	Asian <sup>c</sup>			.01	.06	.95
	Black <sup>d</sup>			-.17	-1.72	.09
	Native American <sup>e</sup>			-.08	-.78	.44
	Other <sup>f</sup>			-.09	-.93	.36
	Population <sup>g</sup>			.16	1.36	.18
2	Cortisol level	.19	.04	.18	1.71	.09
	Intellectuality			-1.16	-1.80	.08
3	Cortisol*Intellectuality	.22	.03	-1.16	-1.81	.07

*Note.* \**p* < .05.

<sup>a</sup>Male is used as a reference group; <sup>b</sup>Caucasian is a reference group = Caucasian;

<sup>c</sup>Caucasian is a reference group; <sup>d</sup>Caucasian is a reference group; <sup>e</sup>Caucasian is a reference group; <sup>f</sup>Caucasian is a reference group; <sup>g</sup>0 = community, 1 = student.

*Post Hoc Testing on Three Way Interaction Effects*

*Three-way interaction among gender, cortisol levels, and mindfulness.*

Based on the results of significant gender difference and interaction between mindfulness and cortisol levels, post hoc testing was performed to examine a three-way interaction effect among gender, cortisol levels, and mindfulness on cold symptoms. The dependent variable, cold symptoms was hierarchically regressed onto cortisol levels (step 1), cortisol levels + mindfulness + cortisol levels\*mindfulness (step 2), and cortisol levels + mindfulness + gender + cortisol levels\*mindfulness + mindfulness\*gender + cortisol levels\*gender + cortisol levels\*mindfulness\*gender (step 3).

Regression analyses indicated that there was a statistically significant main effect of gender on cold symptoms ( $\beta = .95, t = 2.01, p = .047$ ). There were no statistically significant interaction effects of gender and cortisol levels ( $\beta = .67, t = 1.41, p = .16$ ), and no statistically significant interaction effects of gender and mindfulness on cold symptoms ( $\beta = -1.21, t = -1.69, p = .09$ ). However, there was a statistically significant three-way interaction effect among gender, cortisol levels and mindfulness in predicting cold symptoms ( $\beta = -1.39, t = -2.04, p < .05$ ). The plot of three-way interaction effects is shown in Figure 4, and the higher gender refers to women because they were dummy coded as 1 and men were dummy coded as 0 (lower gender). The three-way interaction among gender, cortisol levels and mindfulness implied that mindfulness showed a stronger buffering effects at higher cortisol levels, and mindfulness also showed a stronger buffering effects on cortisol levels for women than for men in predicting cold symptoms.

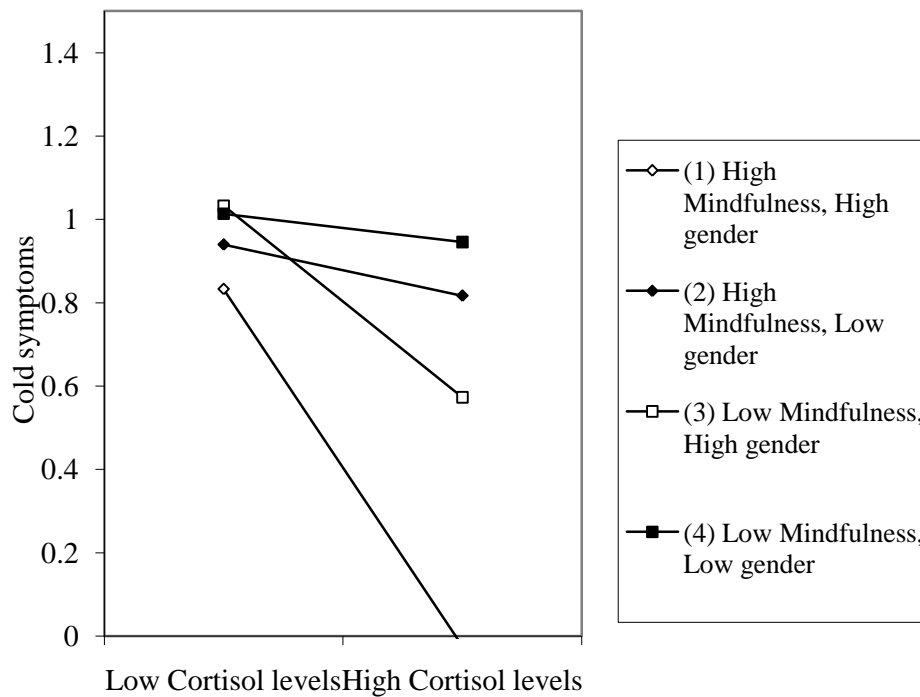


Figure 4. The three-way interaction of gender, cortisol levels, and mindfulness.

Note. High gender = women; low gender = men.

*Three-way interaction among gender, cortisol levels, and extrasensory perception.* A post hoc testing was performed to examine a three-way interaction effect among gender, cortisol levels, and extrasensory perception on cold symptoms. The dependent variable, cold symptoms, was hierarchically regressed onto cortisol levels (step 1), cortisol levels + extrasensory perception + cortisol levels\*extrasensory perception (step 2), and cortisol levels + extrasensory perception + gender + cortisol levels\*extrasensory perception + extrasensory perception\*gender + cortisol levels\*gender + cortisol levels\*extrasensory perception\*gender (step 3).

Regression analyses indicated that there was a statistically significant main effect of gender on cold symptoms ( $\beta = 1.01, t = 2.05, p < .05$ ). There were no statistically significant interaction effects of gender and cortisol levels ( $\beta = .70, t = 1.40, p = .17$ ), but there was a statistically significant interaction effect of gender and extrasensory perception on cold symptoms ( $\beta = -1.54, t = -2.46, p < .05$ ). The three-way interaction effect among gender, cortisol levels and extrasensory perception was also statistically significant in predicting cold symptoms ( $\beta = -1.57, t = -2.59, p = .01$ ). The plot of three-way interaction effects is shown in Figure 5, and the higher gender refers to women, dummy coded as 1 while men were dummy coded as 0 (lower gender). The three-way interaction among gender, cortisol levels and extrasensory perception implied that extrasensory perception showed stronger buffering effects for women than for men in predicting cold symptoms, and the effects were stronger when the stress levels increased.

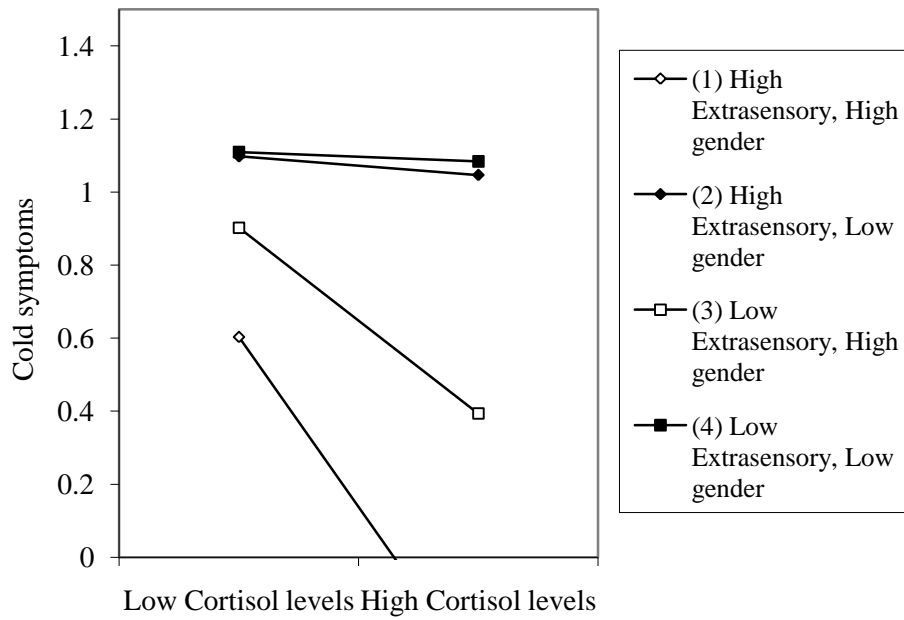


Figure 5. The three-way interaction of gender, cortisol level, and extrasensory perception.

Note. High gender = women; low gender = men.



## Chapter 4

### Discussion

#### *Validation of PsychoMatrix Spirituality Inventory*

Examination of the confirmatory factor analyses indicated that the four-factor PsychoMatrix Spirituality model did not provide a good fit to the data. These results reflect the issues other researchers have raised in terms of the lack of reliable and validated measures for the concept of spirituality (Idler et al., 2003). One possible explanation for the failure to confirm the proposed factor model could be that there was overlap among some factors according to the Lagrange Multiplier Test results. In other words, there is a lack of clear distinctions among the different factors defined by Wolman (2001). For instance, one of the indicators for the extrasensory perception factor (item 25: “I think about my soul living beyond my body”) has shared error variance with an indicator for the intellectuality factor (item 59: “I think about life, death, and the hereafter”). A second issue is that overlap exists among the indicators under one single factor. For example, one of the indicators for the extrasensory perception factor (item 18: “I have conversations with people who have died”) has shared error variance with another indicator for the same factor (item 21: “I sense the presence of loved ones who are no longer living”). Another example for shared error among indicators for the extrasensory perception factor is that item 12 (“I sense something is going to happen before it happens”) has shared error variance with item 40 (“I received phone calls from people just as shortly after I was thinking about them”). One possible solution for this issue is to gather more data on this inventory and do

another exploratory factor analysis to reconstruct the factor model. After exploratory factor analysis being performed, a confirmatory factor analysis would need to be conducted to confirm the reconstructed factor model, and the same process repeated several times until the factor structure holds strong and stable. Based on the results of exploratory and confirmatory factor analyses, some overlapping items may need to be dropped or edited to make this inventory more concise, reliable, and valid.

When researchers tried to go beyond the natural language issues in defining spirituality and religiousness and to move toward operational definitions, problems still existed in defining these two constructs. It is difficult either to equate or separate these constructs, because spirituality and religiousness are distinguishable yet overlapping (Miller & Thoresen, 2003). The same issue appeared in constructing latent constructs of spirituality. The factor structure has been unstable even though the inventory has been edited and revalidated multiple times with different datasets due to the complexity of defining spirituality or its latent factors.

The other issue the PsychoMatrix Spirituality Inventory might have is that it might be contaminated with questions assessing positive traits or mental health as the definition of spirituality was extended (Koenig, 2008). Traditionally, spirituality was used to describe the deeply religious person, but the concept of spirituality has been broadened to include not only indicators of traditional religiousness or a search for the sacred, but also positive psychological states, such

as purpose and meaning in life, connectedness with others, peacefulness, harmony, and well-being. Koenig pointed out a critical issue in spirituality and health research; when spirituality is measured by indicators of good mental health, the associations found between spirituality and good mental health could be meaningless and tautological because constructs measured with the same or similar items will always be correlated with one another. A few items in the PsychoMatrix Spirituality Inventory seem to tap positive psychological traits or human experiences. For example, an indicator for the divinity factor is *I remind myself that human beings are here for a purpose*. In addition, the indicators for mindfulness factor, such as *I practice yoga, meditation, tai chi or other relaxation techniques* may make this factor highly correlate to health. Therefore, the associations between these spiritual factors and health indicators should be examined and interpreted cautiously.

#### *Moderation Effects of Spirituality*

In this study, two spiritual factors, mindfulness and extrasensory perception Wolman (2001), appeared to buffer the adverse effects of stress on cold symptoms. These two spiritual factors were not directly related to stress, nor did they independently reduce cold symptoms; instead, spirituality was related to adjustment through an interaction with stress. These findings seem to be consistent with some previous studies (e.g. Kim & Seidlitz, 2007; Maton, 1989; Park, Cohen, & Herb, 1990) in revealing the moderation effects of spirituality and religiousness; however, comparisons should be made cautiously as spirituality or religiousness

might be defined differently in these studies. For example, Kim and Seidlitz used the Spiritual Transcendence Index (Seidlitz et al., 2002), which captured a subjective experience of the sacred that affects one's self-perception, feelings, goals, and ability to transcend difficulties. Park et al., found that religious coping and intrinsic religiousness served protective functions in life-stress adjustment. The divinity factor defined by Wolman as the sense of a higher power, divine energy source or God, or the feeling of awesome wonder in the presence of natural phenomena, is a similar construct to spirituality or religiousness in the aforementioned studies but did not show a moderating effect on stress and adjustment in the present study. One possible explanation is that the stress in the present study was induced by a laboratory manipulation of viral challenge and assessed by cortisol level, which is considerably different from the stress contexts, such as perceived life stress, in previous studies. Divinity may take a longer period of time to show its protective effects in ameliorating stress, or it may demonstrate stronger effects in buffering stress in different contexts, such as perceived daily stress (e.g., Kim & Seidlitz) or laboratory psychosocial stress (Kajantie & Phillips, 2006).

Mindfulness demonstrated a mitigating influence on stress in predicting cold symptoms in this study. It is critical to look closely at the concept of mindfulness in the psychological literature and examine its relation to the mindfulness factor as defined by Wolman (2001). The concept of mindfulness is rooted in Buddhist psychology, but it shares conceptual kinship with ideas from a

variety of Western philosophical and psychological traditions, suggesting a mode of being and its centrality to the human experience. The nature of mindfulness in Buddhist literature, however, has not been clearly translated into contemporary psychology research (Brown, Ryan, & Creswell, 2007). For example, Brown and Ryan (2003) defined mindfulness as a receptive attention to and awareness of present events and experience. The existing measures of mindfulness, ranging from one to five factors, also reflect a diversity of definitions and a need for conceptual agreement on the meaning of mindfulness (Brown et al.).

A small body of research has evidenced the benefits of mindfulness on health. Creswell, Way, Eisenberger, and Lieberman (2007) investigated the association between mindfulness and neural affect regulation, and they found that mindfulness was associated with enhanced prefrontal cortical regulation of affect through labeling of negative affective stimuli. The findings of the present study seem to support research (Brown et al.; McEwen, 1998) hypotheses that mindfulness permits more direct relief of stress, which leaves more biological and psychological resources available to the organism to maintain health and wellness, and that it permits more adaptive responses to stressors that can cause wear and tear on bodily systems. The mindfulness factor defined by Wolman (2001) implies an acceptance of the interconnection between mind and body. A link between mindfulness and health is possible based on these findings; however, the relationship could also be plausible because the mindfulness factor is contaminated with questions assessing positive human experiences. For instance,

the item “*I pay special attention to the foods I eat*” may promote health itself. The other two items, “*I use relaxation techniques to reduce stress*” and “*meditation has been a meaningful part of my life*”, are directly or indirectly related to relieving stress. Therefore, it is not surprising to find that mindfulness helped to lower cortisol levels in this study.

Extrasensory perception was found to buffer stress in predicting cold symptoms as hypothesized. Wolman’s (2001) extrasensory perception factor refers to a range of experiences and alternative ways of knowing about the self and its relation to the world, which is a measure of experiences rather than a measure of an ability as defined by Beloff and Henry (2005). This alleged ability is to obtain information by non-sensory means, and it is comprised of: (a) telepathy (that is non-sensory communication between separated individuals); (b) clairvoyance (that is the non-sensory awareness of some scene or object); and (c) precognition (that is the non-inferential awareness of future event or state of affairs).

Inconsistent findings have been reported about the relationship between paranormal belief and coping. One possible explanation is that paranormal coping is a unique coping style rather than strategy; thus, it is distinctly different from the ‘traditional’ cognitive-behavioral strategies (Rogers et al., 2006). Research has also found that paranormal beliefs may serve as a mechanism for coping with stress (Irwin, 1992) or offer a powerful emotional refuge to individuals who endured the stress of physical abuse in childhood by providing a sense of control (Perkin & Allen, 2006). LaGrand (2005) conducted interviews with claimants and

discussed with counselors extraordinary experiences of the bereaved for the past 25 years and concluded that the results of these spontaneous encounters have characteristically inspired the claimant to heal emotional wounds, look at life with a new perspective, and often find peace of mind. He suggested that extraordinary experiences are the seeds of change in relationships with others, with those who have died, and with the world at large; in short, they enhance the quality of life. A story reported by a client of mine in therapy also shed some light on how extraordinary experiences might benefit individuals' health. This client who was sexually abused by her step-father shared that her abuse trauma was healed when her step-father came to her dream for asking for forgiveness after he passed away. More research is still needed to better understand how extraordinary experiences buffer stress in different contexts.

The intellectuality factor, developed by Wolman (2001), did not appear to buffer stress, as assessed by cortisol levels, in predicting cold symptoms in the present study. Different from conventional arenas of intellectuality, this factor of intellectuality refers to an energy associated with thought, understanding, and dialogue in relation to ultimate questions and concerns and indicates the degree to which an individual thinks about, reflects on, studies, and discusses with others sacred or spiritual matters. The concept of spiritual intelligence is expressed through this factor as well (Wolman). According to the results, intellectuality, as defined by Wolman, did not appear to demonstrate a significant effect in decreasing cortisol levels in predicting cold symptoms. Even though spiritual

intelligence has been thought to give an ultimate security upon which individuals can base their capacity to be innovative and creative (Moss, 2004), interests in thinking and discussing spiritual matters did not relieve people's stress levels or protect physical health.

Gender, specifically women, was consistently a significant predictor for cold symptoms in all regression analysis in this study, and it suggests that women were more susceptible to bogus virus and to developing cold symptoms than were men, even though their cortisol levels were not significantly different at the time of measurement. These findings may imply that (1) women are more suggestible to develop cold symptoms under a bogus viral challenge, (2) women are more psychologically and/or biologically vulnerable than men under a threat of bogus viral challenge.

Research on sex or gender differences on magical contagion has not been found in the literature; however, studies have been conducted that investigated the role of sex and gender socialization in stress reactivity. Gender has been an important determinant of vulnerability to psychological stress, and a gender difference was reported in studying neurobiological aspect of response to stress (Wang et al., 2007). Wang and his colleagues used functional magnetic resonance imaging (fMRI) to measure cerebral blood flow (CBF) responses to psychological stress elicited by mental arithmetic tasks under varying pressure in 16 males and 16 females. They found that stress in men was associated with CBF increase in the right prefrontal cortex and CBF reduction in the left orbitofrontal cortex, and



stress in women primarily activated the limbic system. In addition, the asymmetric prefrontal activity in men was associated with salivary cortisol but the female limbic activation showed a lower degree of correlation with cortisol. Dedovic, Wadiwalla, and Pruessner (2009) reviewed evidence on sex differences in susceptibility for stress-related disease and indicated that the nature of the stress stimulus can affect the hypothalamic-pituitary-adrenal (HPA) axis at different levels and may also modulate stress response differences observed between men and women. For example, men consistently showed a higher cortisol stress response compared to women when they were subjected to standardized laboratory psychosocial stress tasks, such as public speaking (Kajantie & Phillips, 2006). In contrast, Stroud, Salovey, and Epel (2002) reported that women showed a significant cortisol stress response to a social rejection stress task, whereas cortisol levels remained unchanged in men.

Based on these findings, sex or gender differences in psychological stress and/or stress reactivity in the neural system could still exist even though a significant difference was not detected in salivary cortisol levels in the present study. Beyond focusing on biological sex differences in individuals' resilience to stress and their vulnerability to stress-related disease, Dedovic, Wadiwalla, and Pruessner (2009) proposed a model highlighting gender socialization on the metabolic effects of stress. They suggested that early gender socialization, social learning, gender identity interacting with the quality of parental care, and self-esteem levels are essential factors determining how an individual interprets

the environment and his or her vulnerability to stress within particular contexts. They argued that studies with various stressor contexts or emphasis (that is, achievement versus social integration) have provided support for the gender differences in stress responses. Gender socialization and social modeling have contributed to different value systems and gender-typed concepts in boys and girls (Leaper, 2002; Ruble, Greulich, Pomerantz, & Gochberg, 1993; Tenenbaum & Leaper, 2002); the difference with respect to what is important results in the tendency to be vulnerable to different types of stressors (Dedovic et al.). Early social experiences may affect the development of neuroendocrine systems through alterations in receptor expression, sensitivity, or production of neuropeptides and steroids, which leads to subsequent sexually dimorphic social behavior (Cushing & Kramer, 2005), as animal studies have shown. In a nutshell, both biological and social influences contribute to differences between men and women's stress responses and susceptibility for stress-related symptoms or disease.

The significant three-way interaction effect among gender, cortisol levels, and mindfulness indicated that moderation effects of mindfulness were stronger for women than for men; furthermore, the higher the stress levels were, the stronger the buffering effects were for both men and women. This finding implies that mindfulness showed stronger protective effects for women than for men. A similar finding was found in the three way interaction effects among gender, cortisol levels, and extrasensory perception. The moderation effects of extrasensory perception were much stronger for women than for men, and the

effects were stronger when the stress levels elevated. Women seem to benefit more from mindfulness and extrasensory perception than did men in terms of stress reduction. And mindfulness and extrasensory perceptions show stronger protective effects as stress levels increase for both men and women.

To summarize, it is concluded that relationships among spiritual factors, stress and physical health do exist; however, more research is required to figure out the complexity of their associations and variations among different populations. Relationships between multiple dimensions of spirituality and different kinds of stressors need to be further investigated to understand better what aspects of spirituality help individuals cope with certain kinds of stress in different populations. More research is required on biological aspect of differences between men and women, and gender as a social construct should be investigated by assessing gender identity concepts and psychosocial development. In addition, more research is needed to understand the gender differences in stress responses and vulnerability for stress-related symptoms and diseases.

Findings of the present study suggest that mindfulness-related practices, such as meditation and yoga, and experiences of extrasensory perception could be ways to help individuals relieve stress and improve health. From an applied perspective, these results have implications for developing preventions or interventions that incorporate mindfulness practices and take extrasensory perception experiences into consideration for stress reduction and health promotion. A gender difference should be taken into account when developing

prevention and intervention programs. For instance, it is important to address the protective effects of mindfulness practice and experiences of extrasensory perception for women to release stress when they are more vulnerable but also to benefit more from these practices or experiences than men do.

Several limitations of the current study should be noted. The sample sizes were relatively small, and data imputation resulted in more conservative research findings. Future research with larger samples is necessary to replicate the findings for establishing generalizability. A psychometrically sound spirituality instrument is an essential element in advancing quality of spirituality research. Spirituality should be defined clearly and the construct of spirituality should be assessed separate from measures of mental or physical health, at least in health-related research. Mindfulness is a latent factor within the broadened concept of spirituality defined by Wolman (2001); however, it has been far from a unitary construct in the psychological literature. More knowledge and understanding of mindfulness is needed to define the constructs clearly. Eastern and Western approaches to mind and body are fundamentally different, and this may influence what is meant by mindfulness.

Given the sensitivity of stress responses to specific context and intensity, applying the current findings to different types of stress contexts should be done with caution. Nevertheless, this study may be an important step for understanding the relationships between different spiritual factors and cortisol levels under an acute laboratory stress related to magical contagion manipulations. Psychologists

may develop gender and stress specific intervention programs to be more effective in helping clients with different genders or gender identities manage different types of stress. For instance, mindfulness practices and extrasensory perception experiences are helpful, particularly for women, for releasing physical stress. As women could be more suggestible to the magical contagion and to its negative effects, women may also benefit more from a variety of psychotherapy interventions than do men. It is critical for psychologists to be aware of the gender differences in clients' perceptions toward their stressors and tailor interventions accordingly to meet individual needs.

## REFERENCES

- Aiken, L. S., & West, S. G. (1991). *Multiple regression: Testing and interpreting interactions*. Thousand Oaks, CA, US: Sage Publications, Inc.
- Aldwin, C. M., & Revenson, T. A. (1987). Does coping help? A reexamination of the relation between coping and mental health. *Journal of Personality and Social Psychology*, *53*, 337-348.
- Amanzio, M., & Benedetti, F. (1999). Neuropharmacological dissection of placebo analgesia: Expectation-activated opioid systems versus conditioning-activated specific subsystems. *Journal of Neuroscience*, *19*(1), 484-494.
- Anderson, J. C., & Gerbing, D. W. (1988). Structural equation modeling in practice: A review and recommended two-step approach. *Psychological Bulletin*, *103*(3), 411-423.
- Astin, J. A., & Forys, K. (2004). Psychosocial determinants of health and illness: Integrating mind, body, and spirit. *Advances in Mind-Body Medicine*, *20*(4), 14-21.
- Bantha, R., Moskowitz, J. T., Acree, M., & Folkman, S. (2007). Socioeconomic differences in the effects of prayer on physical symptoms and quality of life. *Journal of Health Psychology*, *12*(2), 249-260.
- Baron, R. M., & Kenny, D. A. (1986). The moderator-mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. *Journal of Personality and Social Psychology*, *51*, 1173-1182.
- Beasley, M., Thompson, T., & Davidson, J. (2003). Resilience in response to life stress: the effects of coping style and cognitive hardiness. *Personality and Individual Differences*, *34*, 77-95.
- Beloff, J., & Henry, J. (2005). Extrasensory perception. In J. Henry (Ed.), *Parapsychology: Research on exceptional experiences*. London: Routledge.
- Berg, G. E., Fonss, N., Reed, A. J., & VandeCreek, L. (1995). The impact of religious faith and practice on patients suffering from a major affective disorder: a cost analysis. *Journal of Pastoral Care*, *49*, 359-363.

- Bergin, A. E., Stinchfield, R. D., Gaskin, T. A., Masters, K. S., & Sullivan, C. E. (1988). Religious life-styles and mental health: An exploratory study. *Journal of Counseling Psychology, 35*(1), 91-98.
- Beuscher, L., & Beck, C. (2008). A literature review of spirituality in coping with early-stage alzheimer's disease. *Journal of Clinical Nursing, 17*(5a), 88-97.
- Breslin, M. J., & Lewis, C. A. (2008). Theoretical models of the nature of prayer and health: A review. *Mental Health, Religion & Culture. Special Issue: Prayer and Mental Health, 11*(1), 9-21.
- Brown, K. W., & Ryan, R. M. (2003). The benefits of being present: Mindfulness and its role in psychological well-being. *Journal of Personality and Social Psychology, 84*(4), 822-848.
- Brown, K. W., Ryan, R. M., & Creswell, J. D. (2007). Mindfulness: Theoretical foundations and evidence for its salutary effects. *Psychological Inquiry, 18*(4), 211-237.
- Cacioppo, J. T. (1998). Somatic responses to psychological stress: The reactivity hypothesis. In Sabourin, M., Craik, F., and Robert, M. (Eds.) *Advances in psychological science, Vol. 2: Biological and cognitive aspects* (pp. 87-112). England: Psychology Press.
- Callaghan, A., & Irwin, H. J. (2003). Paranormal belief as a psychological coping mechanism. *Journal of the Society for Psychical Research, 67*(872), 200-207.
- Calvo, M. G., & Cano-Vindel, A. (1997). The nature of trait anxiety: Cognitive and biological vulnerability. *European Psychologist, 2*(4), 301-312.
- Carmody, J., Reed, G., Kristeller, J., & Merriam, P. (2008). Mindfulness, spirituality, and health-related symptoms. *Journal of Psychosomatic Research, 64*(4), 393-403.
- Carroll, D. (1992). *Health psychology :Stress, behaviour and disease*. London; Washington, DC: Falmer Press.
- Cohen, J. (2003). *A power primer*. Washington, DC, US: American Psychological Association.
- Cohen, S. (2005). Keynote presentation at the eight international congress of behavioral medicine: The pittsburgh common cold studies: Psychosocial

- predictors of susceptibility to respiratory infectious illness. *International Journal of Behavioral Medicine*, 12(3), 123-131.
- Cohen, S. (. (1988). *Perceived stress in a probability sample of the united states*. Thousand Oaks, CA, US: Sage Publications, Inc.
- Cohen, S., Kessler, R. C., & Gordon, L. U. (1995). *Measuring stress*. New York: Oxford University Press.
- Cohen, S. Kessler, R. C., & Gordon, L. U. (1997). *Measuring stress: A guide for health and social scientists*. New York, NY, US: Oxford University Press.
- Cohen, S., Frank, E., Doyle, W. J., Skoner, D. P., Rabin, B. S., & Gwaltney, J. M., Jr. (1998). Types of stressors that increase susceptibility to the common cold in healthy adults. *Health Psychology*, 17(3), 214-223.
- Cohen, S., Tyrrell, D. A., & Smith, A. P. (1991). Psychological stress and susceptibility to the common cold. *New England Journal of Medicine*, 325(9), 606-612.
- Creswell, J. D., Way, B. M., Eisenberger, N. I., & Lieberman, M. D. (2007). Neural correlates of dispositional mindfulness during affect labeling. *Psychosomatic Medicine*, 69(6), 560-565.
- Cushing, B. S., & Kramer, K. M. (2005). Mechanisms underlying epigenetic effects of early social experience: The role of neuropeptides and steroids. *Neuroscience & Biobehavioral Reviews*, 29(7), 1089-1105.
- Dedovic, K., Wadiwalla, M., Engert, V., & Pruessner, J. C. (2009). The role of sex and gender socialization in stress reactivity. *Developmental Psychology*, 45(1), 45-55.
- Denollet, J., & DeVries, J. (2006). Positive and negative affect within the realm of depression, stress and fatigue : The two-factor distress model of the Global Mood Scale (GMS). *Journal of Affective Disorders*, 91, 171-180.
- Dinan, T. G. (2005). Stress: The shared common component in major mental illnesses. *European Psychiatry*, 20(Suppl3), S326-S328.
- Dudley, R. T. (1999). The relationship between negative affect and paranormal belief. *Personality and Individual Differences*, 28, 315-321.
- Dudley, R. T., & Whisnand, E. A. (2000). Paranormal belief and attributional styles. *Psychological Reports*, 86, 836-864.



- Edmondson, D., Park, C. L., Chaudoir, S. R., & Wortmann, J. H. (2008). Death without god: Religious struggle, death concerns, and depression in the terminally ill. *Psychological Science, 19*(8), 754-758.
- Elam, D. A. (2001). An exploration of the relationship between spirituality and emotional well-being. *Dissertation Abstracts International, 62*(6-B), 2955. (AAI No. 3019252)
- Emmons, R. A. (1999). *The psychology of ultimate concerns: Motivation and spirituality in personality*. New York: Guilford.
- Erdfelder, E., Faul, F., & Buchner, A. (1996). GPOWER: A general power analysis program. *Behavior Research Methods, Instruments, & Computers, 28*, 1-11.
- Ferraro, K., & Koch, J. (1994). Religion and health among black and white adults : Examining social support and consolation. *Journal for the Scientific Study of Religion, 33*(4), 362-375.
- Fitchett, G., Rybarczyk, B. D., DeMarco, G. A., & Nicholas, J. J. (1999). The role of religion in medical rehabilitation outcomes: A longitudinal study. *Rehabilitation Psychology, 44*(4), 333-353.
- Folkman, S., & Lazarus, R. S. (1980). An analysis of coping in a middle-aged community sample, *Journal of Health and Social Behavior, 21*, 219-239.
- Folkman, S., & Lazarus, R. S. (1985). If it changes it must be a process: Study of emotion and coping during three stages of a college examination. *Journal of Personality and Social Psychology, 48*(1), 150-170.
- Frazier, P. A., Tix, A. P., & Barron, K. E. (2004). Testing moderator and mediator effects in counseling psychology. *Journal of counseling psychology, 51*, 115-134.
- Gaab, J., Rohleder, N., Nater, U. M., & Ehlert, U. (2005). Psychological determinants of the cortisol stress response: The role of anticipatory cognitive appraisal. *Psychoneuroendocrinology, 30*(6), 599-610.
- Gall, T. L., Charbonneau, C., Clarke, N. H., Grant, K., Joseph, A., & Shouldice, L. (2005). Understanding the nature and role of spirituality in relation to coping and health: A conceptual framework. *Canadian Psychology/Psychologie Canadienne, 46*(2), 88-104.

- Glaser, R., Kiecolt-Glaser, J. K., Bonneau, R. H., & Malarkey, W. (1992). Stress-induced modulation of the immune response to recombinant hepatitis B vaccine. *Psychosomatic Medicine*, *54*(1), 22-29.
- Goldman, N., Gleib, D. A., Seplaki, C., Liu, I. -, & Weinstein, M. (2005). Perceived stress and physiological dysregulation in older adults. *Stress: The International Journal on the Biology of Stress*, *8*(2), 95-105.
- Grossman, P., Niemann, L., Schmidt, S., & Walach, H. (2004). Mindfulness-based stress reduction and health benefits: A meta-analysis. *Journal of Psychosomatic Research*, *57*(1), 35-43.
- Hahn, S., Kroenke, K., Spitzer, R., Williams, J., Brody, D., Linzer, M., & deGruy, F. (1996). The difficult patient in primary care: Prevalence, psychopathology and impairment. *Journal of General Internal Medicine*, *11*, 1-8.
- Hatch, R. L., Burg, M. A., Naberhaus, D. S., & Hellmich, L. K. (1998). The spiritual involvement and beliefs scale: Development and testing of a new instrument. *The Journal of Family Practice*, *46*(6), 476-486.
- Hill, P. C., & Pargament, K. I. (2003). Advances in the conceptualization and measurement of religion and spirituality: Implications for physical and mental health research. *American Psychologist*, *58*(1), 64-74.
- Hill, P. C., & Pargament, K. I. (2008). Advances in the conceptualization and measurement of religion and spirituality: Implications for physical and mental health research. *Psychology of Religion and Spirituality*, *5*(1), 3-17.
- Hu, L., & Bentler, P. M. (1995). Evaluating model fit. In R. H. Hoyle (Ed.), *Structural equation modeling: Concepts, issues, and applications*. (pp. 76-99). Thousand Oaks, CA, US: Sage Publications, Inc.
- Hu, L., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling*, *6*(1), 1-55.
- Ider, E. L., & Kasl, S. V. (1997). Religion among disabled and nondisabled persons: I. Cross-sectional patterns in health practices, social activities, and well-being. *Journal of Gerontology Series B: Psychological Sciences and Social Sciences*, *52*, S294-S305.
- Idler, E. L., Musick, M. A., Ellison, C. G., George, L. K., Krause, N., Ory, M. G., et al. (2003). Measuring multiple dimensions of religion and spirituality for

health research: Conceptual background and findings from the 1998 general social survey. *Research on Aging*, 25(4), 327-365.

- Ironson, G., Antoni, M. H., Schneiderman, N., Chesney, M. A., O'Leirigh, C., Balbin, E., et al. (2002). Coping: Interventions for optimal disease management. In M. A. Chesney, & M. H. Antoni (Eds.), *Innovative approaches to health psychology: Prevention and treatment lessons from AIDS*. (pp. 167-195). Washington, DC, US: American Psychological Association.
- Irwin, H. J. (1992). Origins and functions of paranormal belief: The role of childhood trauma and interpersonal control. *Journal of the American Society for Psychical Research*, 86(3), 199-208.
- Kajantie, E., & Phillips, D. I. W. (2006). The effects of sex and hormonal status on the physiological response to acute psychosocial stress. *Psychoneuroendocrinology*, 31(2), 151-178.
- Kaufman, G. D. (1981). *The theological imagination: Constructing the concept of God*. Philadelphia: Westminster Press.
- Keinan, G. (1994) Effects of stress and tolerance of ambiguity on magical thinking. *Journal of Personality and Social Psychology*, 67, 48-55.
- Kiecolt-Glaser, J. K. (1986). Modulation of cellular immunity in medical students. *Journal of Behavioral Medicine*, 9(1), 5-21.
- Kiecolt-Glaser, J. K., Fisher, L. D., Ogrocki, P., & Stout, J. C. (1987). Marital quality, marital disruption, and immune function. *Psychosomatic Medicine*, 49(1), 13-34.
- Kiecolt-Glaser, J. K., & Glaser, R. (1995). Measurement of immune response. In S. Cohen, R. C. Kessler & L. U. Gordon (Eds.), *Measuring stress: A guide for health and social scientists*. (pp. 213-229). New York, NY, US: Oxford University Press.
- Kiecolt-Glaser, J. K., & Glaser, R. (2001). Stress and immunity: Age enhances the risks. *Current Directions in Psychological Science*, 10(1), 18-21.
- Kiecolt-Glaser, J. K., McGuire, L., Robles, T. F., & Glaser, R. (2002). Psychoneuroimmunology: Psychological influences on immune function and health. *Journal of Consulting and Clinical Psychology. Special Issue: Behavioral Medicine and Clinical Health Psychology*, 70(3), 537-547.

- Kim, Y., & Seidlitz, L. (2002). Spirituality moderates the effect of stress on emotional and physical adjustment. *Personality and Individual Differences*, 32(8), 1377-1390.
- Kirkpatrick, L. A. (1995). Attachment theory and religious experience. In R. W. Hood, Jr. (Ed.), *Handbook of religious experience* (PP. 446-475). Birmingham, AL: Religious Education Press.
- Kirschbaum, C., & Hellhammer, D. H. (1994). Salivary cortisol in psychoneuroendocrine research: Recent developments and applications. *Psychoneuroendocrinology*, 19(4), 313-333.
- Koenig, H. G. (2007). Religion and depression in older medical inpatients. *American Journal of Geriatric Psychiatry*, 15(4), 282-291.
- Koenig, H. G. (2008). Concerns about measuring "spirituality" in research. *Journal of Nervous and Mental Disease*, 196(5), 349-355.
- Koenig, H. G. (1994). *Aging and god: Spiritual pathways to mental health in midlife and later years*. New York, NY, England: Haworth Pastoral Press/Haworth Pres.
- Koshi, E. B., & Short, C. A. (2007). Placebo theory and its implications for research and clinical practice: A review of the recent literature. *Pain Practice*, 7(1), 4-20.
- Krause, N. (2008). The social foundation of religious meaning in life. *Research on Aging*, 30(4), 395-427.
- Kroenke, K. (2003). Patients presenting with somatic complaints: Epidemiology, psychiatric co-morbidity and management. *International Journal of Methods in Psychiatric Research*, 12(1), 34-43.
- LaGrand, L. E. (2005). The nature and therapeutic implications of the extraordinary experiences of the bereaved. *Journal of Near-Death Studies*, 24(1), 3-20.
- Langer, E. J. (1989). Minding matters: The consequences of mindlessness-mindfulness. In L. Berkowitz (Ed.), *Advances in experimental social psychology*, vol. 22. (pp. 137-173). San Diego, CA, US: Academic Press.
- Langer, E. J., & Moldoveanu, M. (2000). The construct of mindfulness. *Journal of Social Issues*, 56(1), 1-9.

- Lantz, P. M., House, J. S., Lepkowski, J. M., Williams, D. R., Mero, R. P., & Chen, J. (1998). Socioeconomic factors, health behaviors, and mortality: Results from a nationally representative prospective study of US adults. *JAMA: Journal of the American Medical Association*, 279(21), 1703-1708.
- Larson, D. B., Swyers, J. P., & McCullough, M. E. (Eds.). (1998). *Scientific research on spirituality and health: A report based on the Scientific Progress in Spirituality Conferences*. Rockville, MD: National Institute for Healthcare Research.
- Laubmeier, K. K., Zakowski, S. G., & Bair, J. P. (2004). The role of spirituality in the psychological adjustment to cancer: A test of the transactional model of stress and coping. *International Journal of Behavioral Medicine*, 11(1), 48-55.
- Lazarus, R. S. (1977). Psychological stress and the coping in adaptation and illness. In Z. J. Lipowski, D. R. Lipsi, and P. C. Whybrow (Eds.), *Psychosomatic Medicine: Current Trends* (pp. 14-26). New York: Oxford University Press.
- Leaper, C. (2002). Parenting girls and boys. In M. H. Bornstein (Ed.), *Handbook of parenting: Vol. 1: Children and parenting (2nd ed.)*. (pp. 189-225). Mahwah, NJ, US: Lawrence Erlbaum Associates Publishers.
- Lee, B. (2007). Moderating effects of religious/spiritual coping in the relation between perceived stress and psychological well-being. *Pastoral Psychology*, 55(6), 751-759.
- Levin, J. S., Taylor, R. J., & Chatters, L. M. (1994). Race and gender differences in religiosity among among older adults: Findings from four national surveys. *Journals of Gerontology*, 49(3), S137-S145.
- Levin, J. S., Taylor, R. J., & Chatters, L. M. (1995). A multidimensional measure of religious involvement for african americans. *Sociological Quarterly*, 36(1), 157-173.
- MacDonald, D. A., Kuentzel, J. G., & Friedman, H. L. (1999). A survey of measures of spiritual and transpersonal constructs: Part two--additional instruments. *Journal of Transpersonal Psychology*, 31(2), 155-177.
- Mahalik, J. R., & Lagan, H. D. (2001). Examining masculine gender role conflict and stress in relation to religious orientation and spiritual well-being. *Psychology of Men & Masculinity*, 2(1), 24-33.

- Maller, J. B., & Lundeen, G. E. (1934). Superstition and emotional maladjustment. *Journal of Educational Research*, 27, 592-617.
- Marsland, A. L., Bachen, E. A., Cohen, S., Rabin, B., & Manuck, S. B. (2002). Stress, immune reactivity and susceptibility to infectious disease. *Physiology & Behavior. Special Issue: The Pittsburgh Special Issue*, 77(4-5), 711-716.
- Maton, K. I. (1989). The stress-buffering role of spiritual support: Cross-sectional and prospective investigations. *Journal for the Scientific Study of Religion*, 28(3), 310-323.
- Matthews, J. P. (2004). Spirituality and self-efficacy in counseling and social work trainees. *Dissertation Abstracts International*, 65(10-A). (UMI No. 3149240)
- Matud, M. P. (2004). Gender differences in stress and coping styles. *Personality and Individual Differences*, 37(7), 1401-1415.
- Matute, H. (1994). Learned helplessness and superstitious behavior as opposite effects of uncontrollable reinforcement in humans. *Learning and Motivation*, 25, 215-232.
- McAdoo, H. P. (1995). Stress levels, family help patterns, and religiosity in middle-and working-class african american single mothers. *Journal of Black Psychology*, 21(4), 424-449.
- McEwen, B. S. (1998). Protective and damaging effects of stress mediators. *New England Journal of Medicine*, 338, 171-179.
- Meraviglia, M. G. (2002). Prayer in people with cancer. *Cancer Nursing*, 25, 326-331.
- Miller, W. R., & Thoresen, C. E. (2003). Spirituality, religion, and health: An emerging research field. *American Psychologist*, 58(1), 24-35.
- Miltiades, H. B., & Pruchno, R. (2002). The effect of religious coping on caregiving appraisals of mothers of adults with developmental disabilities. *The Gerontologist*, 42(1), 82-91.
- Monat, A., & Lazarus, R. S. (1991). *Stress and coping: An anthology (3rd ed.)*. New York, NY, US: Columbia University Press.

- Moss, B. (2004). TGIM: Thank God it's Monday. *British Journal of Occupational Learning*, 2, 33-43.
- Mystakidou, K., Tsilika, E., Parpa, E., Hatzipli, I., Smyrnioti, M., Galanos, A., et al. (2008). Demographic and clinical predictors of spirituality in advanced cancer patients: A randomized control study. *Journal of Clinical Nursing*, 17(13), 1779-1785.
- Nemeroff, C. J. (2005). Interpersonal perceptions and the placebo/nocebo effect. Unpublished raw data.
- Nemeroff, C., & Rozin, P. (2000). The makings of the magical mind: The nature and function of sympathetic magical thinking. In K. S. Rosengren, C. N. Johnson & P. L. Harris (Eds.), *Imagining the impossible: Magical, scientific, and religious thinking in children*. (pp. 1-34). New York, NY, US: Cambridge University Press.
- Nemeroff, C. J. (1995). Magical thinking about illness virulence: Conceptions of germs from "safe" versus "dangerous" others. *Health Psychology*, 14(2), 147-151.
- Noble, K. D. (2001). *Riding the windhorse: Spiritual intelligence and the growth of the self*. Cresskill, NJ, US: Hampton Press.
- Ozorak, E. W. (1996). The power, but not the glory: How women empower themselves through religion. *Journal for the Scientific Study of Religion*, 35(1), 17-29.
- Padgett, V. R., & Jorgenson, D. O. (1982). Superstition and economic threat: Germany, 1918-1940. *Personality and Social Psychology Bulletin*, 8, 736-741.
- Pargament, K. I., Koenig, H. G., Tarakeshwar, N., & Hahn, J. (2001). Religious struggle as a predictor of mortality among medically ill elderly patients: A 2-year longitudinal study. *Archives of Internal Medicine*, 161(15), 1881-1885.
- Pargament, K. I. (1997). *The psychology of religion and coping: Theory, research, practice*. New York, NY, US: Guilford Press.
- Park, C. L., & Cohen, L. H. (1993). Religious and nonreligious coping with the death of a friend. *Cognitive Therapy and Research*, 17(6), 561-577.

- Park, C., Cohen, L. H., & Herb, L. (1990). Intrinsic religiousness and religious coping as life stress moderators for catholics versus protestants. *Journal of Personality and Social Psychology*, 59(3), 562-574.
- Park, C. L. (2007). Religiousness/spirituality and health: A meaning systems perspective. *Journal of Behavioral Medicine*, 30(4), 319-328.
- Parkes, K. R. (1990). Coping, negative affectivity, and the work environment: Additive and interactive predictors of mental health. *Journal of Applied Psychology*, 75, 399-409.
- Pearlin, L. I., & Schooler, C. (1978). The structure of coping. *Journal of Health and Social Behavior*, 19(1), 2-21.
- Perkins, S. L., & Allen, R. (2006). Childhood physical abuse and differential development of paranormal belief systems. *Journal of Nervous and Mental Disease*, 194(5), 349-355.
- Peterson, C., Semmel, A., von Baeyer, C., Abramson, L. Y., Metalsky, G. I., & Seligman, M. E. (1982). The Attributional Style Questionnaire. *Cognitive Therapy and Research*, 6, 287-299.
- Poloma, M. M., & Gallup, G. H. (1991). *Varieties of prayers: A survey report*. Philadelphia, PA: Trinity Press International.
- Powell, L. H., Shahabi, L., & Thoresen, C. E. (2003). Religion and spirituality: Linkages to physical health. *American Psychologist*, 58(1), 36-52.
- Powers, D. V., Cramer, R. J., & Grubka, J. M. (2007). Spirituality, life stress, and affective well-being. *Journal of Psychology & Theology*, 35(3), 235-243.
- Reich, K. H. (1997). Do we need a theory for the religious development of women? *International Journal for the Psychology of Religion*, 7(2), 67-86.
- Rief, W., Shaw, R., & Fichter, M. M. (1998). Elevated levels of psychophysiological arousal and cortisol in patients with somatization syndrome. *Psychosomatic Medicine*, 60(2), 198-203.
- Rogers, P., Qualter, P., Phelps, G., & Gardner, K. (2006). Belief in the paranormal, coping and emotional intelligence. *Personality and Individual Differences*, 41(6), 1089-1105.
- Ruble, D. N., Greulich, F., Pomerantz, E. M., & Gochberg, B. (1993). The role of gender-related processes in the development of sex differences in



- self-evaluation and depression. *Journal of Affective Disorders. Special Issue: Toward a New Psychobiology of Depression in Women*, 29(2-3), 97-128.
- Saberi, K. (1995). Some considerations on the use of adaptive methods for estimating interaural-delay thresholds. *Journal of the Acoustical Society of America*, 98(3), 1803-1806.
- Schreiber, J. B., Stage, F. K., King, J., Nora, A., & Barlow, E. A. (2006). Reporting structural equation modeling and confirmatory factor analysis results: A review. *Journal of Educational Research*, 99(6), 323-337.
- Seidlitz, L., Abernethy, A. D., Duberstein, P. R., Evinger, J. S., Chang, T. H., & Lewis, B. L. (2002). Development of the spiritual transcendence index. *Journal for the Scientific Study of Religion*, 41(3), 439-453.
- Shafranske, E. P., & Maloney, (1996). Religion and the clinical practice of psychology: A case for inclusion. In E. P. Shafranske (Ed.), *Religion and the clinical practice of psychology* (pp. 561-586). Washington, DC: American Psychology Association.
- Sorajjakool, S., & Lambertson, H. (2004). *Spirituality, health, and wholeness :An introductory guide for health care professionals*. New York: Haworth Press.
- Stroud, L. R., Salovey, P., & Epel, E. S. (2002). Sex differences in stress responses: Social rejection versus achievement stress. *Biological Psychiatry*, 52(4), 318-327.
- Tabachnick, B. G., & Fidell, L. S. (2007). *Using multivariate statistics*. (5<sup>th</sup> ed.). Boston: Pearson Education.
- Tartaro, J., Luecken, L. J., & Gunn, H. E. (2005). Exploring heart and soul: Effects of Religiosity/Spirituality and gender on blood pressure and cortisol stress responses. *Journal of Health Psychology*, 10(6), 753-766.
- Tenenbaum, H. R., & Leaper, C. (2002). Are parents' gender schemas related to their children's gender-related cognitions? A meta-analysis. *Developmental Psychology*, 38(4), 615-630.
- Tobacyk, J. J. (1988). *A Revised Paranormal Belief Scale*. Unpublished manuscript.
- Wang, J., Korczykowski, M., Rao, H., Fan, Y., Pluta, J., Gur, R. C., et al. (2007). Gender difference in neural response to psychological stress. *Social Cognitive and Affective Neuroscience*, 2(3), 227-239.

- Wheat, L. W. (1992). Development of a scale for the measurement of human spirituality. *Dissertation Abstracts International*, 52(9-A), 3230.
- Wilkinson, R. B., Walford, W. A., & Espnes, G. A. (2000). Coping styles and psychological health in adolescents and young adults: A comparison of moderator and main effects models. *Australian Journal of Psychology*, 52, 155-162.
- Wink, P., Dillon, M., & Prettyman, A. (2007). Religion as moderator of the sense of control-health connection: Gender differences. *Journal of Religion, Spirituality & Aging*, 19(4), 21-41.
- Wolman, R. N. (. (2001). *Thinking with your soul: Spiritual intelligence and way it matters*. New York, NY, US: Harmony Books.
- Young, C., & Koopsen, C. (2004). *Spirituality, health, and healing*. Thorofare, NJ: Slack.
- Young, J. S., Cashwell, C. S., & Shcherbakova, J. (2000). The moderating relationship of spirituality on negative life events and psychological adjustment. *Counseling and Values*, 45(1), 49-57.

APPENDIX A  
RESEARCH CONSENT FORM

Department of Psychology  
Mind/Body Health Lab

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Dr. Carol Nemeroff, who is an Associate Professor in the Department of Psychology at Arizona State University, has requested your participation in a research study at this institution. Please carefully read all of the information presented in this form. Feel free to ask the researcher(s) to explain any unclear phrases or terms. Once you have read the form and have had all questions fully answered, please sign and date this form if you agree to participate in this study.

**PURPOSE OF THE STUDY:**

The purpose of this study is to examine factors that influence susceptibility to the common cold and similar illnesses. Your participation will contribute to the understanding of the relationships between psychological factors, immune function, and overall health.

**PROCEDURES:**

You will be asked to complete 3 phases of participation: a first laboratory visit, 3 days of at-home monitoring, and a follow-up laboratory visit/health assessment.

*Initial Laboratory Visit*

During your first visit you will be asked to fill-out a questionnaire that asks about such things as your health, the amount of stress in your life, and aspects of your personality. This will take approximately 45 minutes to complete. In addition you will be asked to provide a series of saliva samples. This will involve drooling through a straw into a small plastic tube. Your saliva only will be tested for levels of cortisol (a stress hormone) and sIgA (a substance in your saliva that measures activity of your immune system). During this session a researcher will administer nasal drops to you. The drops are highly purified and do not contain any agent that could cause symptoms beyond those of the common cold.

*At-Home Monitoring*

Following this exposure, you will be sent home and asked to fill in diary entries about how you are feeling and your general health behaviors that relate to any cold symptoms you might be experiencing at regular intervals over the next 3 days using a Palm Pilot, which will be provided to you. You will also be asked to collect saliva samples daily. You will be given verbal and written instructions on how to complete these tasks at home.

*Follow-Up Laboratory Visit/Health Assessment*

You will be scheduled and asked to return for a brief follow-up health assessment three days after your initial session. As part of this assessment you will be asked to complete a questionnaire about your participation. The assessment will take approximately 1 hour. You will also return the palm pilot, saliva samples, and other materials provided to you at that time.

*Please initial here to acknowledge you have read and understand the information on this page.*

→ \_\_\_\_\_

**POSSIBLE RISKS AND DISCOMFORTS:**

As part of your participation you may experience symptoms such as those of the common cold. However, there is no risk of exposure to agents beyond what one regularly encounters in daily life. If at any time during your participation in this study you feel that your symptoms are severe or overly concerning, you are advised to contact Dr. Carol Nemeroff immediately at the number provided below.

**POSSIBLE BENEFITS:**

Although there may be no direct benefit to you, the possible benefit of your participation in the research includes contributing to our knowledge about perceptions of illness susceptibility and resistance. Your name or individual results will not be shared and you or anyone else other than the researchers will not receive any individual results. You will be compensated for your participation as described below.

**CONFIDENTIALITY/PRIVACY:**

We will keep the study information private. The results of the research study may be published but your name or identity will not be revealed. If you agree to be in the study, we will assign you a study ID number. The file with your name and number will be stored securely in Dr. Nemeroff's laboratory and destroyed at the close of the study, which is approximately three years from now. Further, all saliva samples will be labeled only with your ID number and the samples will only be analyzed for the purposes of this study, as described above. The samples are destroyed after being tested.

**TERMINATION/WITHDRAWAL:**

You do not have to participate in this or any research study. Your participation is completely voluntary. If you do join, and later change your mind, you may quit at any time without penalty.

**COMPENSATION:**

You will be paid \$50.00 at the initial study visit and an additional \$75.00 at the second visit for a total of \$125.00.

**QUESTIONS YOU MAY HAVE ABOUT THE RESEARCH STUDY:**

Any questions you have concerning the research study or your participation in it, before or after your consent, will be answered by Dr. Carol Nemeroff, Department of Psychology, Arizona State University, 480-965-7345; or Michael Hoyt, MA Project Manager of the Mind/Body Health Laboratory.

If you have questions about your rights as a subject/participant in this research, or if you feel you have been placed at risk, you can contact the Chair of the Human

Subjects Institutional Review Board, through the ASU Research Compliance Office, at 480-965 6788.

*Please initial here to acknowledge you have read and understand the information on this page.* → \_\_\_\_\_

**WHAT YOUR SIGNATURE MEANS:**

This form explains the nature, demands, benefits and any risk of the project. Please read it carefully. Ask questions about anything you do not understand. If you do not have questions now, you may ask at any time in the future. By signing this form you agree knowingly to assume any risks involved. Remember, your participation is voluntary. You may choose not to participate or to withdraw your consent and discontinue participation at any time without penalty or loss of benefit. In signing this consent form, you are not waiving any legal claims, rights, or remedies. A copy of this consent form will be given to you.

Your signature below indicates that you understand the information given to you about the study and that you consent to participate.

\_\_\_\_\_  
Participant's Name (printed)

\_\_\_\_\_  
Participant's Signature

\_\_\_\_\_  
Date

**CONSENTOR'S STATEMENT:**

*By signing below, I certify that:*

1. I have explained to the above individual the nature and purpose, the potential benefits and possible risks associated with participation in this research study, have answered any questions that have been raised, and have witnessed the above signature.
2. These elements of Informed Consent conform to the Assurance given by Arizona State University to the Department of Health & Human Services to protect the rights of human subjects.
3. I have offered the subject/participant a copy of this signed consent document.

\_\_\_\_\_  
Consentor's Signature

\_\_\_\_\_  
Date

APPENDIX B

PHYSICAL SYMPTOMS CHECKLIST

Code: \_\_\_\_\_

## Symptom Checklist

Please indicate the degree to which you are currently experiencing the following symptoms	Not at all	A little	Moderately	Quite a Bit	Extremely
Fever	1	2	3	4	5
Body aches/pains	1	2	3	4	5
Runny nose	1	2	3	4	5
Nasal congestion	1	2	3	4	5
Sneezing	1	2	3	4	5
Sinus pressure	1	2	3	4	5
Earache	1	2	3	4	5
Nausea/vomiting	1	2	3	4	5
Diarrhea	1	2	3	4	5
Upset stomach	1	2	3	4	5
Fatigue	1	2	3	4	5
Dizziness	1	2	3	4	5
Itchy/watery eyes	1	2	3	4	5
Bloody nose	1	2	3	4	5
Chest congestion	1	2	3	4	5
Cough	1	2	3	4	5
Sore throat	1	2	3	4	5
Headache	1	2	3	4	5
Stiff neck	1	2	3	4	5
Swollen glands	1	2	3	4	5
Wheezing	1	2	3	4	5
Post-nasal drip	1	2	3	4	5
Chills	1	2	3	4	5
Trouble sleeping	1	2	3	4	5
Trouble concentrating	1	2	3	4	5
General malaise (feeling "down")	1	2	3	4	5
Loss of appetite	1	2	3	4	5
Other (indicate):	1	2	3	4	5
Other (indicate):	1	2	3	4	5
Other (indicate):	1	2	3	4	5



How are the symptoms you are experiencing interfering with your everyday life?

APPENDIX C

PSYCHOMATRIX SPIRITUALITY INVENTORY

Code: \_\_\_\_\_

Psychomatrix Spirituality Inventory

If you are uncertain about the meaning of any of the following statements, answer them to the best to your ability. There are no right or wrong answers, only your answers. Please give a sincere response to each question.	Never	Seldom	Often	Always
I set aside time for contemplation and self-reflection.	1	2	3	4
Blessings comfort me.	1	2	3	4
I consult with clergy for spiritual healers.	1	2	3	4
I forgive myself for my own failings.	1	2	3	4
I am aware of a transcendent energy source.	1	2	3	4
I exercise alone.	1	2	3	4
Mind-altering drugs can be useful enhancements to spiritual experiences.	1	2	3	4
I discuss spirituality openly.	1	2	3	4
When I see a magnificent sunset or sunrise, experience a beautiful day, or observe the structure of a flower or starlit sky, I am aware of a divine presence.	1	2	3	4
I have experienced serious physical injury. (used in my analysis only)	1	2	3	4
I said my prayers at night as a child.	1	2	3	4
I have witnessed serious illness in people close to me.	1	2	3	4
I exercise with friends.	1	2	3	4
I feel the divinity of people I meet.	1	2	3	4
I think about the effects on humankind of the approaching millennium.	1	2	3	4
I pay special attention to the foods I eat.	1	2	3	4
I remind myself that human beings are here for a purpose.	1	2	3	4
I have conversations with people who have died.	1	2	3	4
I sense something is going to happen before it happens.	1	2	3	4
I participate in community activities, such as PTO, civic, political programs.	1	2	3	4
I discuss the existence of a Higher Being.	1	2	3	4
I discuss spiritual issues with people who are close to me.	1	2	3	4
I use my own sense of ethics to guide my actions.	1	2	3	4
I feel distant from God.	1	2	3	4
I think about my soul living beyond my body.	1	2	3	4
I practice yoga, meditation, tai chi, or other relaxation techniques.	1	2	3	4

My parents read the Bible or other religious books to me as a child.	1	2	3	4
I feel that my life is directed by God.	1	2	3	4
I like to read books such as the Bible, Koran, Upanishads, Book of the Dead, etc.	1	2	3	4
I volunteer time with the needy, homeless, etc.	1	2	3	4
I use relaxation techniques to reduce stress.	1	2	3	4
I use certain foods to energize me.	1	2	3	4
I understand the events of life as part of a divine plan.	1	2	3	4
I attended religious services as a child.	1	2	3	4
I currently practice the religion of my birth.	1	2	3	4
If I feel sick, I remind myself that my body is influenced by my state of mind.	1	2	3	4
My parents spoke to me about God.	1	2	3	4
I pray at specific times of the day.	1	2	3	4
I feel the connectedness of all living beings.	1	2	3	4
I feel awed by the power of nature.	1	2	3	4
I feel connected to my body.	1	2	3	4
I read books and articles about religious questions.	1	2	3	4
I feel close to God.	1	2	3	4
I feel disconnected from my body.	1	2	3	4
I have witnessed emotional or psychic trauma in people close to me.	1	2	3	4
If someone I love is seriously ill, I say prayers for his or her recovery.	1	2	3	4
I use spirit guides to help me through crises.	1	2	3	4
I forgive others for their hurtful actions.	1	2	3	4
I attend classes or workshops about spirituality.	1	2	3	4
I sense my own divinity.	1	2	3	4
I feel the presence of a Power greater than myself.	1	2	3	4
Scientific explanations give me peace of mind in confusing life situations.	1	2	3	4
I judge others by my own ethical standards.	1	2	3	4
I sense the presence of loved ones who are no longer living.	1	2	3	4
I devote time to a spiritual community.	1	2	3	4
I have had out-of-body experiences.	1	2	3	4
My prayers have been answered.	1	2	3	4
I think about life, death, and the hereafter.	1	2	3	4
I turn to my angel for guidance.	1	2	3	4
Meditation has been a meaningful part of my life.	1	2	3	4
Beautiful music, powerful art, or meaningful theater makes me cry.	1	2	3	4

I read about spiritual matters.	1	2	3	4
I question many of the teachings of religion.	1	2	3	4
I receive phone calls from people just as shortly after I was thinking about them.	1	2	3	4
I focus on scientific explanations of major life events such as illness or death.	1	2	3	4
I have experience miracles.	1	2	3	4
I attend religious services.	1	2	3	4
I choose medical caregivers who are attentive to spiritual experience.	1	2	3	4
I have attended conferences concerning spirituality.(used in my analysis only)	1	2	3	4
I have experienced emotional or psychic trauma.	1	2	3	4
I eat alone.	1	2	3	4
I follow a specific ethical code when deciding difficult issues.	1	2	3	4
I think about returning after death in a new life form.	1	2	3	4
I have experienced past lives.	1	2	3	4
I like to eat with other people.	1	2	3	4
I use alternative therapies such as acupuncture, aromatherapy, or massage.	1	2	3	4
I use certain foods to calm me.	1	2	3	4
I have experienced serious illness in myself.(used in my analysis)	1	2	3	4
I have had near-death experiences.(used in my analysis)	1	2	3	4