

On the Validity of Stress Mindset

Christopher J. Kilby BPsy (Hons)

Department of Psychology, Macquarie University

Supervisor: A/Prof Kerry Sherman

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Abstract

Stress mindset theory claims that beliefs about stress influence people's responses to stressful situations. This research lacks empirical demonstrations of both concurrent validity and whether stress mindset can display characteristics attributable to a mindset. This thesis aimed to identify observable characteristics of a mindset, and to explore one characteristic in stress mindset, namely the stability of a mindset. Furthermore, this thesis extended the construct validity of stress mindset by assessing the relationship between stress mindset and perceived stress, trait anxiety, emotional management, and the Big Five personality traits. A literature review of mindset-related research identified four observable characteristics of mindsets, including that they: 1) are composed of a range of relevant beliefs; 2) influence one's perceptions and responses to the mindset; 3) are stable over time; and, 4) are malleable with training. To assess the construct validity and stability of stress mindset a prospective online study was undertaken. Participants ($N = 123$) completed three online surveys over one month assessing stress mindset, personality, trait anxiety, perceived stress, and emotional management. Stress mindset demonstrated concurrent validity with trait anxiety, emotional management, perceived stress, openness, and neuroticism. Baseline stress mindset predicted stress mindset at both follow ups. These findings provide further evidence for the construct validity and stability of stress mindset. Additional research is required to identify the direction of effect between stress mindset and these constructs.

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Declaration of Originality

The works found within this thesis are original and have not been submitted for publication, written by another person, nor submitted for a higher degree to any other university or institution. The empirical research contained within this thesis was approved by the Human Research Ethics Committee at Macquarie University (reference number: HREC 5001500090).

A handwritten signature in black ink, appearing to read 'C. Kilby', with a stylized, cursive script.

Christopher J. Kilby BPsy (Hons)

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“Adopting the right attitude can convert a negative stress into a positive one”

- Hans Selye (1974)

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The Nature of a Mindset:

A Narrative Review of Mindset Research Applied to Stress Mindset

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The Nature of a Mindset:

A Narrative Review of Mindset Research Applied to Stress Mindset

In late 2013, stress mindset theory was proposed by Crum, Salovey, and Achor. This theory claimed that an individual's beliefs about stress influence that individual's biological, psychological, and behavioural responses to stressful situations (Crum, Salovey, & Achor, 2013). To date, there is only one published article (Crum et al., 2013) and one manuscript submitted for publication (Kilby & Sherman, 2015) examining this theory. Stress mindset theory was conceived in response to the evidence for the dual nature of stress whereby it can be potentially both enabling and debilitating. This evidence suggested that stress can have positive (for a review, see: Linley & Joseph, 2004) and negative (for a review, see: Lupien, Maheu, Tu, Fiocco, & Schramek, 2007) effects on individuals at both a psychological and physiological level. For example, the stress of traumatic events, such as being diagnosed with a chronic illness or cancer, can lead to positive outcomes, such as increased social connectedness in some people (Moreno & Stanton, 2013; Tedeschi & Calhoun, 2004), but this same stress can also lead to negative outcomes, such as depression and anxiety in others (Piet, Wurtzen, & Zachariae, 2012).

Evidence is emerging to suggest that this range of responses to stress could be connected with our beliefs about stress (Daniels, Hartley, & Travers, 2006; Keller et al., 2012). Keller et al. (2012) followed nearly 29, 000 individuals from the 1998 American National Health Interview Survey over an eight year period, tracking their health and whether they believed that stress had an impact on their health. In this study, Keller et al. (2012) demonstrated that individuals who held the belief that stress was bad for their health in 1998 were more than 43% more likely to die a premature death than people who did not hold this belief across the following eight years. Crum et al. (2013) later proposed that there are four beliefs that influence how a person reacts to stress, centred around wellbeing, growth,

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productivity, and uncertainty. These beliefs are said to influence the way in which we perceive stress by focussing our attention on the elements of a stressor that are congruent with these beliefs. This is achieved through a positive and a negative stress mindset, known as enhancing and debilitating stress mindsets, respectively (Crum et al., 2013). It is proposed that this selective attention to detail leads to different responses to stressors.

An enhancing stress mindset, as suggested by Crum et al. (2013), is a set of primarily positive beliefs about stress. People with enhancing stress mindsets report holding beliefs such as “stress offers the opportunity for learning, gain, or mastery”, and “stress can improve productivity and health”. These beliefs are said to motivate people to work through the problems causing their stress. As such, people with enhancing stress mindsets are not likely to avoid stressful situations, but are motivated to engage with and overcome the stressor. On the other hand, Crum et al. (2013) describe a debilitating stress mindset as a set of primarily negative beliefs about stress whereby stress is believed to have a negative impact on productivity and health, often with perceived potential losses associated with the stressor. The negative beliefs are thought to motivate avoidant behaviours that encourage the person to try to escape the threat of the stressful situation (Crum et al., 2013). As such, people with this mindset try to avoid stressing as much as possible. However, by consciously trying to avoid stress, people with debilitating stress mindsets are thought to stress about potentially becoming stressed (Crum et al., 2013). This is said to inflate the perceived stress levels of people with debilitating mindsets. As such, people with debilitating stress mindsets tend to report greater levels of perceived stress than for those individuals with enhancing stress mindsets (Crum et al., 2013). It should be noted that the influence of either a debilitating or enhancing stress mindset is strongest when all the individual’s beliefs about stress are either enhancing or debilitating (Crum et al., 2013). In this way, stress mindset is a continuum which ranges from debilitating stress mindsets through to enhancing stress mindsets.

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Individuals who report greater enhancing stress mindsets (i.e., who report a greater number of positive beliefs) are more likely to report fewer depression and anxiety symptoms than individuals with debilitating stress mindsets. Crum et al. (2013) further demonstrated that these effects can be achieved through manipulating stress mindset. This experimental manipulation involved three conditions: enhancing, debilitating, and control. Over one week, participants in the enhancing condition received three short videos promoting the positive effects of stress. These were intended to shift the participants' stress mindsets towards an enhancing stress mindset by increasing the number of positive beliefs about stress. Similarly, the debilitating condition received three short videos promoting the negative effects of stress that were intended to shift participants' mindsets towards the debilitating end of the stress mindset continuum by increasing the number of negative beliefs about stress. The control condition did not receive any video footage. It was found that shifting individuals towards the enhancing end of the stress mindset continuum resulted in them having a greater overall wellbeing (where overall wellbeing collectively represented depression, anxiety, and mood) compared to pre-manipulation wellbeing levels. The opposite was true of participants in the debilitating condition, where an experimentally induced shift towards the debilitating end of the stress mindset continuum was associated with lower overall wellbeing when compared to pre-manipulation levels. Furthermore, there was no significant change in the stress mindset or overall wellbeing of participants in the control condition. These findings serve as evidence for the effectiveness of a brief, information-based intervention promoting either positive or negative effects about stress, as well as providing insight into the causal influence of stress mindset on overall wellbeing.

Crum et al. (2013) suggest that the influence of enhancing and debilitating stress mindsets on the stress response is due to the filtering nature of a type of heuristic known as a mindset. A heuristic is a cognitive shortcut, or rule of thumb, used to minimise the amount of

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thinking involved in processing information (Agans & Shaffer, 1994; Eysenck & Keane, 2010). Essentially, a heuristic aids in keeping up with the vast amounts of complex and conflicting information the individual encodes from their environment (Eysenck & Keane, 2010; Tversky & Kahneman, 1974). These shortcuts help to select which information should be encoded from the environment (Bayer & Gollwitzer, 2005), which information is irrelevant (Dweck, 2012), and how to respond to this information (Gigerenzer & Todd, 1999; Tversky & Kahneman, 1974). Heuristics can operate at different points in time (Eysenck & Keane, 2010). Some examples of these points in time include the point when people are making a decision (Kahneman & Tversky, 1974), the point when people are thinking in hindsight (Agans & Shaffer, 1994), or at the point when information is being encoded into cognition, as is the case for mindsets (Bayer & Gollwitzer, 2005; Crum et al., 2013; Dweck, 2006). A mindset functions as a cognitive filter that helps minimise the cognitive workload required to handle conflicting information (Crum et al., 2013; Dweck, 2008a). Here, the mindset biases what information is encoded from the environment by selectively searching and focussing on information that is congruent with one's beliefs (Dweck, 2006). Thus, the mindset should influence decisions made about the stimulus, as these decisions will be based on this filtered information.

The beliefs encapsulated in stress mindset have been shown to influence the way we respond to stress at the behavioural level (i.e., the ways in which a person will cope with a stressor), the psychological level (for example, the relationship between depression/anxiety and stress mindset), and the physiological level (such as the relationship between stress hormones and stress mindset; Crum et al., 2013). This influence over behaviour, psychology, and physiology is theorised to be the result of the mindset heuristic. Yet, no empirical research has been conducted to date to confirm this assumption that stress mindset influences the stress response through a mindset. What is lacking is the prescription of observable

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properties of a mindset from which these relationships could be confirmed. This paper aims to provide an in-depth review of the relevant literature to identify a set of criteria by which the observable properties of a mindset can be described. A secondary aim of this paper is to compare these new criteria against the stress mindset literature. This will identify the research required to confirm the role of mindsets in stress mindset.

The Research into Mindsets.

A mindset is thought to be composed of a *set of beliefs* that function together to bias the way we perceive a stimulus (Bayer & Gollwitzer, 2005; Cohen, 2010; Dweck, 2012) . Mindsets have been described for a range of different beliefs (e.g., Levy, Slade, Kunkel, & Kasl, 2002; Sassenberg & Moskowitz, 2005). Two of the most well-researched mindsets include the global mindset (Gupta & Govindarajan, 2002; Javidan, Steers, & Hitt, 2007; Javidan & Teagarden, 2011) and the mindset about intelligence (Blackwell, Trzesniewski, & Dweck, 2007; Chiu, Hong, & Dweck, 1997; Dweck, 2009). This review will predominantly focus on these two mindsets due to the large body of literature surrounding them. The ‘global mindset’ is a well-established construct in the organisational literature with research purporting that business owners are more likely to be successful at expanding their business internationally if they believe that they are open to cultural diversity and have the capacity to work within other cultures (Cohen, 2010; Gupta & Govindarajan, 2002; Kedia & Mukherji, 1999; Nummela, Saarenketo, & Puumalainen, 2009). For the mindset about intelligence, beliefs surrounding one’s control over intelligence are thought to influence one’s response to opportunities for learning. Here, people who hold a set of beliefs surrounding the notion that they can improve their intelligence (known as a growth mindset) are more likely to seek out opportunities to improve their intelligence over time, compared to people who do not hold this set of beliefs (known as a fixed mindset; Dweck, 2006; Dweck, 2008b).

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Mindsets are often described as a continuum, representing a ratio of positive to negative beliefs (Dweck, 2012). The extent of this positive to negative ratio is thought to have real implications for the individual, such that the influence of the mindset on an individual is strongest when the beliefs are all positive, or alternatively, all negative (for example, Dweck, 2008b; Lundberg, 2005; Taylor & Gollwitzer, 1995). In relation to the mindset about intelligence, an individual who falls towards the extreme end of this mindset, towards a growth mindset, is thought to have a greater number of positive beliefs about their control over their intelligence, compared to the number of negative beliefs. The other extreme of this mindset, a fixed mindset, contains a greater number of negative beliefs, in ratio to positive beliefs, about one's control over one's intelligence (Dweck, 2009). It can, therefore, be proposed that a mindset theory should be able to accurately assess this ratio of positive and negative beliefs. To do so, the theory would have to encapsulate a range of relevant beliefs. If the theory did not encapsulate a range of relevant beliefs, then this ratio may be miscalculated. Therefore, the appropriateness and range of beliefs encapsulated by a mindset can serve as one criterion by which a mindset can be defined.

Mindsets are also thought to influence *how we respond* to the subject of a mindset. If the subject of the mindset is control over intelligence, then the mindset should influence how we respond to opportunities to improve our intelligence (Dweck, 2008b). Similarly, if the subject of the mindset was cultural diversity in businesses (as is the case in the global mindset), then the mindset should influence how the business owners of that organisation respond to opportunities for experiencing and assimilating with other cultures (Murtha, Lenway, & Bagozzi, 1998). The exact process by which the mindset influences these responses is currently being debated with two opposing perspectives; the first view is a bottom-up argument directly tied to mindset research, and the second is a top-down argument from belief-based research. The first argument postulates that the mindset functions as a

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cognitive filter, which analyses and refines information from the environment such that only belief-congruent information is encoded into cognition for later processing (Crum et al., 2013; Dweck, 2008a). Here, it is thought that the individual's response to the subject of the mindset is mandated by *how* information is filtered (Dweck, 2010). The alternative argument is that we are predisposed to focus on information congruent with our beliefs, such that we involuntarily seek out and attend to the information that we expect to see while ignoring the information that we do not expect to see, based upon our beliefs (Watson & Tharp, 2007). As such, this position argues that the individual's response to the subject of the mindset is mandated by *what* information is expected to be in the environment (Eccles & Wigfield, 2002). Despite the fact that these two ideas are distinctively different, they both suggest that a set of beliefs comprising a mindset should influence what information is perceived by the individual about the subject of the mindset, and by extension, how an individual then responds to the subject of the mindset.

Studies using a cross-sectional approach have demonstrated correlational relationships between mindsets and behaviour (Dweck & Leggett, 1988; Grant, 2001; Javidan et al., 2007; Javidan & Teagarden, 2011; Kobrin, 1994; Potgieter & Steyn, 2010). For example, a number of studies addressing global mindsets, have demonstrated that business managers who hold beliefs favouring cultural diversity are more likely to seek out cross-cultural business endeavours, compared to managers who do not hold these beliefs (Gupta & Govindarajan, 2002; Javidan et al., 2007; Javidan & Teagarden, 2011; Kobrin, 1994). Additionally, qualitative research into beliefs about old age and physical activity by Grant (2001) revealed that individuals over the age of 70 who held beliefs that their age negatively impacted their ability to be physically active were less active than individuals who did not hold these beliefs. Another study that addressed the relationship between the mindset about intelligence and athletes' reaction to success and failure in sport at a South African university found that

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athletes who held a growth mindset were more likely to react positively to success and failure in sport, compared to athletes who held a fixed mindset (Potgieter & Steyn, 2010). These cross-sectional findings provide initial evidence for the role of mindsets in behaviour.

There has been limited experimental research to support the notion that mindsets directly influence the way an individual responds to the stimulus of that mindset, with the majority of this research occurring within the mindset about intelligence (Dweck, 2009, 2012; Thornton & McEntee, 1995). The limited experimental research provides support for the causal influence of mindsets, or at least for mindsets about intelligence, on behaviour. For example, Dweck (2008b) developed a computer program, 'Brainology', to improve children's mindsets regarding their control over their intelligence. This study by Dweck (2008b) demonstrated that as the children's mindset improved (i.e., shifted towards a growth mindset), they spent an increased number of hours working through mathematical problems within the game. Another study by Good, Aronson, and Inzlicht (2003) demonstrated that the reading ability of low-income minority adolescents in America can be improved through an online mentor-based mindset intervention where mentors encouraged a growth mindset via instant messaging. Good et al. (2003) also included a control group whose mentors focussed on anti-drug use, rather than information regarding mindsets about intelligence; this control condition did not report any improvement in reading ability. As such, there is emerging evidence from the literature surrounding the mindset about intelligence that connects a person's mindset to the responses they make about the subject of the mindset. Therefore, another criterion by which a mindset can be evaluated is the proposition that the mindset should be able to demonstrate that the beliefs encapsulated by the mindset will influence behaviour.

If a mindset is the product of a set of beliefs (Crum & Langer, 2007; Dweck, 2008b), then any changes in the beliefs should, in turn, change the mindset (Dweck, 2008a; Lundberg,

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2005; Sassenberg & Moskowitz, 2005). Beliefs, in general, are thought to be relatively stable over time (Watson & Tharp, 2007). This stability is said to be generated from the top-down belief-driven attention bias described earlier (Watson & Tharp, 2007). It is also suggested that changing one's beliefs requires a conscious effort to search and attend to information that is congruent with the new beliefs (Watson & Tharp, 2007). In other words, a mindset should not change over time, for the beliefs underlying it do not change without conscious effort. In this way, the belief-congruent information encoded by the mindset should confirm and solidify the currently held beliefs; this should in turn solidify the mindset (Dweck, 2006; Thornton & McEntee, 1995). As such, the relationship between the stability of beliefs and the stability of the related mindset can be thought of as an endless feedback loop that, if uninterrupted, should not change.

There is empirical evidence to support the claim that mindsets are relatively stable over time without any specific intervention (Blackwell et al., 2007; Chiu et al., 1997; Donohoe, Topping, & Hannah, 2012; Good et al., 2003). For example, Blackwell et al. (2007) conducted an eight-week experiment on the intelligence mindsets of adolescent school students, expecting greater growth mindsets to be associated with greater school grades. Students were allocated into either an experimental condition where their mindsets were shifted towards growth mindsets, or students were allocated into a control condition that received no intervention. This study demonstrated that students in the experimental condition had improved class grades, but that the control condition's grades remained the same. More importantly, however, the mindset of control participants did not change over the eight weeks of the study (Blackwell et al., 2007). These findings are supported by other experimental works demonstrating that the mindsets of participants who did not receive an intervention did not change; these studies demonstrated the stability of the mindset from a few minutes (Chiu et al., 1997; Kilby & Sherman, 2015) to over 6 months (Good et al., 2003).

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Although a mindset can be informed by both positive and negative beliefs about the subject of the mindset, and can thus encode conflicting information (Dweck, 2008b), this information should not be enough to shift the belief in the long-term. For example, one study attempted to experimentally alter children's mindsets about intelligence over a one-week period by providing information that was incongruent with their belief sets via the Brainology computer program (Donohoe, Topping, & Hanna, 2012). It was found that initially following exposure to the incongruent information, the children's mindset significantly changed, but these changes were not sustained over the following three month period during which there was no further intervention (Donohoe et al., 2012). Taken together, these findings suggest that a mindset should be characterised by a relative long-term stability and a resistance to permanent change from transient exposure to incongruent information. However, brief interventions appear to result in short-term changes in stress mindset. This may be related to the ideas of Watson and Tharp (2007) which state that the influence of beliefs on behaviour can be overcome by making a conscious effort to attend to information in the environment that is contrary to one's beliefs. If that conscious effort is not maintained, then the old mindset should resume.

Adjacent to the idea that mindsets are stable over time, it has been demonstrated that mindsets can also be altered through training incorporating purposeful exposure to conflicting information that is encoded and reinforced repeatedly (Bayer & Gollwitzer, 2005; Dweck, 2010, 2012). Here, the beliefs driving the mindset must be changed through education about the desired beliefs (Donohoe et al., 2012; Dweck, 2012) and reinforced repeatedly through praise or practice to make a lasting change (Dweck, 2008b). In turn, an intervention that does not reinforce the new beliefs would not be likely to make lasting changes to the mindset (Donohoe et al., 2012). Unfortunately, the majority of experimental mindset studies do not measure mindset changes in the longer term, precluding any conclusions regarding the

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intervention's ability to retain changes in mindset over time. Longevity of mindset change should be an important consideration in this area of research given the findings of Donohoe et al. (2012). As such, a mindset should be malleable with short interventions, but lasting change may require ongoing training and reinforcement.

The preceding review of the literature suggests that a mindset should have at least four characteristics: i) a set of beliefs appropriate to the subject of the mindset; ii) a demonstrable influence over behaviour relating to the subject of the mindset; iii) stability across time; and, iv) malleability with training. These characteristics should be demonstrable in any mindset. Therefore, stress mindset should be able to demonstrate these four qualities. The initial research conducted by Crum et al. (2013) has provided preliminary evidence for all of these criteria. This review will now compare these four criteria to the stress mindset research and highlight areas within this research that could be improved upon.

Comparing the New Mindset Criteria to the Stress Mindset Literature

1. Beliefs about Stress.

If a mindset is composed of an appropriate set of beliefs (Dweck, 2010), then clearly too should stress mindset be composed of an appropriate set of beliefs about stress. The study by Crum et al. (2013) described stress mindset as being composed of beliefs relating to i) health and vitality, ii) learning and growth, iii) performance and productivity, and iv) uncertainty and change. These beliefs were generated via group discussions with faculty, graduate students, and postdoctoral fellows from a university-based health, emotion, and behavioural laboratory. However, the research by Crum et al. (2013) did not attempt to empirically verify that these four types of beliefs are an appropriate set of beliefs about stress, nor did this research explore other possible beliefs surrounding stress.

One belief that may be relevant to the stress response (and by extension, stress mindset) is an individual's perceived control over stress. This perceived control encapsulates

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the individual's beliefs regarding whether stress is a consequence of the individual's actions, and is thus within the individual's control, or if stress is a consequence of the environment and, therefore, out of the individual's control (adapted from Bandura, 2006). This idea of beliefs about controlling one's stress is similar to the beliefs about controlling one's intelligence from the intelligence mindsets of Dweck (2008b). The belief of controlling stress is important in understanding an individual's response to stress, as it has been demonstrated to influence how people perceive stress. A study by Bernadi (2011) investigated beliefs about control over stress in newly-hired junior accountants. He found that the accountants who believed they had control over their stress perceived their stress as being an important aspect in their achievements and successes at work. Those who did not hold this belief did not view their workplace stress in this way. The belief about control over stress does not fit neatly into any of the four categories of stress beliefs outlined by Crum et al. (2013), and suggests that there may be more to stress mindset than the four beliefs generated by the health, emotion, and behavioural laboratory.

Another belief about stress that has not been considered in the stress mindset theory (nor stress research generally) may be an individual's beliefs about what constitutes the stress response itself. If an individual were to misattribute a physiological experience, for example, a headache, to part of the stress response, then the stress response may in fact induce the expected headache for that individual (Martin, 2010; Martin & MacLeod, 2009). In this way, stress is thought to become a "trigger", causing the onset of the headache (Connelly & Bickel, 2011). Research specifically into this relationship between stress and headaches suggests that the headache is a by-product of an increase in anxiety associated with the stress where the onset of stress causes a spike in anxiety and worry about the potential onset of a headache, this anxiety in turn causes the headache (Martin, 2010; Martin & MacLeod, 2009). If this misattribution and triggering applied to other physiological responses to stress, such as

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increases in heart rate, adrenaline levels, or aggression, then it could be postulated that the individual's beliefs about what constitutes the stress response may have a direct influence on the way an individual perceives and responds to a stressful situation. Huesmann and Guerra (1997) refer to this sort of belief as a "situation-specific normative belief". They define this belief as an expectation of what is socially accepted and expected of an individual given the specific situation such as "It's ok to hit others if they hit you first" (Huesmann & Guerra, 1997, p. 409). A stress-based situation-specific normative belief could be "I always get headaches when I get stressed" or "I always feel so angry when I get stressed". As such, this stress-based situation-specific normative belief could very well stand as a second category of stress beliefs that has not been considered in the stress mindset theory. Clearly, more research is needed in this area to supplement the existing data from Crum et al. (2013) and to delineate a full range of beliefs known to influence the stress response.

2. Perceiving and Responding to a Stressor.

It has been proposed that a mindset serves to influence and bias the way we perceive information from our environment (Dweck, 2012). In this way, it would be expected that two people with very different stress mindsets (i.e., one with a debilitating stress mindset, and the other with an enhancing stress mindset) should view the same stressor differently (Crum et al., 2013). Our recent manuscript that has been submitted for publication (Kilby & Sherman, 2015) is the only empirical work to date that has considered this question. We assessed the relationship between stress mindset and the extent to which a stressor (a difficult mathematics task) was perceived as an opportunity for gain and mastery (known as a challenge appraisal) and the extent to which the mathematics task was perceived as an opportunity for loss and harm (known as a threat appraisal). The findings suggested that people who have a stress mindset towards the enhancing end of the stress mindset continuum perceived the stressor to be more challenging than those with a stress mindset towards the debilitating end. However,

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there was no evidence that people with enhancing stress mindsets perceived the stressor as less threatening, compared to people with debilitating stress mindsets.

As such, these findings suggest that stress mindset only relates to one aspect of the stress response. A further investigation entailing a longitudinal study where stress mindset is manipulated over time may help to better explain these findings. The study by Crum et al. (2013) demonstrated a successful manipulation of stress mindset over a one week period. However, the focus of this study was to demonstrate that manipulating stress mindset led to changes in wellbeing and work performance. Consequently, there was no assessment of how stressors were perceived. Therefore, there is the potential for researchers to explore the effect of a stress mindset manipulation on the perception of stressors to ascertain whether stress mindset causally influences the way stressors are perceived. Such a study would use a manipulation analogous to that of the stress mindset manipulation conducted by Crum et al. (2013). However, the participant would be presented with a stressor at both baseline and follow up. It would be expected that a participant's perception and responses to the stressor would change as a function of their stress mindset.

3. Stress Mindset Stability.

The third characteristic of a mindset that has been proposed by this review is stability over time. Here it is thought that the beliefs driving the mindset should not receive enough contradictory information in normal day-to-day life for those beliefs to change. Measuring a mindset's stability over time would involve simply measuring scores repeatedly over a period of time. It would thus be expected that stress mindset scores at baseline would predict later stress mindset scores. However, it is known that even stable constructs will slowly change over very long periods of time (Caspi & Roberts, 1990). As such, studies should seek to measure stress mindset over periods of time that are as long as possible to establish the extent of stress mindset's stability.

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Crum et al. (2013) have provided some very preliminary findings on this stability in stress mindset. The control condition of Crum et al. (2013) stress mindset manipulation, as discussed earlier, did not significantly change over the one week period. However, this was conducted over a single week. It is possible that if stress mindset does change over time, that it takes longer than a single week to detect the change. Furthermore, a graphical representation of the control group's scores demonstrated a non-significant decrease in stress mindset. If this decrease was indeed a true trend of stress mindset scores, and these scores continued to steadily decrease over time, then the decrease may become significant between baseline and later points in time. However, if the decrease in scores was a result of measurement error, then there should be no significant change in stress mindset scores at later points in time.

Given that stress mindset has only been assessed across a single week, any study extending beyond a week will provide useful information into stress mindset's stability. The use of multiple time points will also evaluate whether the non-significant decrease in stress mindset scores over the one-week period seen in Crum et al. (2013) is a true reflection of a slow change in stress mindset, or if it was an artefact of measurement error. It could be argued that demonstrating stress mindset's stability is the most pressing issue of the stress mindset theory; given that the stress mindset theory has already provided preliminary evidence that the beliefs encompassed in the theory influence perceptions and responses of stressors, as would be expected. As such, demonstrating the stability of stress mindset stands as the characteristic of the mindset mechanism with the weakest body of support.

4. Stress Mindsets Malleability.

As previously mentioned, a mindset should not only be stable over time, but should also be malleable with training and conscious effort. The manipulation conducted by Crum et al. (2013) demonstrated that stress mindset can be changed over a one-week period with

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training. Participants in the enhancing mindset condition demonstrated a small, yet significant increase in stress mindset scores (i.e., their mindset shifted towards the enhancing end of the stress mindset continuum). Similarly, participants in the debilitating condition demonstrated a decrease in stress mindset scores.

While these findings provide preliminary support for the malleability of stress mindset, the findings were measured over a single week with no follow-up studies. Without longer post-intervention follow-ups, it is not possible to assess the stability of the change in stress mindset. Moreover, if stress mindset is indeed stable over time, then one must wonder if three short videos over one week are enough to make lasting changes to one's beliefs. This hesitation to accept the longevity of this one-week manipulation is further reinforced by the findings of Donohoe et al. (2012). As such, the manipulation conducted by Crum et al. (2013) needs to be replicated with additional follow-up assessments to evaluate how long the manipulated stress mindset remains altered. It may also be the case that a manipulation targeted at improving stress mindset requires booster sessions after the initial week to maintain the change in stress mindset, similar to booster sessions in cognitive behavioural therapy (Schlup, Munsch, Meyer, Margraf, & Wilhelm, 2009). There is thus a need not only to understand how stable the manipulations effects are on stress mindset, but also to understand when booster sessions are most needed to support lasting changes made to the stress mindset.

Conclusion

Stress mindset, a theory purporting that beliefs about stress bias the way people perceive stressors, has been proposed as a novel explanation for why different people respond differently to the same stressor (Crum et al., 2013). Initial research into stress mindset has confirmed this purported theory, suggesting that stress mindset does relate to the stress response. However, this research is yet to demonstrate that stress mindset influences the

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stress response via the theorised mindset mechanism. This is important as a mindset has a number of properties that could be exploited in stress-related interventions to improve people's stress mindset. There is yet to be an established set of criteria by which a theory (such as stress mindset) can be empirically tested against to confirm that the theory functions via a mindset mechanism. As such, this review sought to synthesise the mindset theory literature to determine the common traits regularly seen in other mindset studies. This established set of criteria was then applied to the stress mindset literature to develop a direction for future stress mindset research.

This review argued that there should be four observable characteristics of a mindset. First, the mindset theory should have an underlying set of appropriate beliefs (Dweck, 2012). Second, the mindset should influence the way an individual perceives and responds to the subject of the mindset (Crum & Langer, 2007). Third, that the mindset is stable over time. Finally, that the mindset can be changed with ongoing training (Bayer & Gollwitzer, 2005). As such, any theory proposing to function via a mindset mechanism should be able to at least demonstrate these four criteria. For stress mindset, there are opportunities for further research in all four of these criteria. Regarding beliefs, there is yet to be any research confirming that the stress mindset theory is inclusive of all related beliefs. For the influence of mindset on encoding information, research has suggested that more enhancing stress mindsets are associated with more challenging perceptions of stressors (Kilby & Sherman, 2015). However, these findings were correlational and thus, cannot make an inference into causality. Stress mindset needs to be manipulated over time to confirm that the mindset is the causal factor influencing how stressors are encoded. In relation to stress mindset's stability, there is a need to expand beyond Crum et al. (2013) such that stress mindset is measured for longer than a single week to ascertain the period of time that stress mindset remains stable over time. Finally, for the malleability of stress mindset, research needs to confirm that the changes

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achieved by the one week manipulation of Crum et al. (2013) are enduring changes that are not lost over time.

This literature review has not only proposed criteria by which a mindset may be compared, but has compared a relatively new mindset (stress mindset) to these criteria. This comparison has produced four potential pathways for stress mindset research, highlighting the usefulness of these criteria for furthering research into potential mindsets. These four pathways for stress mindset research could not be studied in a single piece of research, and therefore stand as a set of empirical works needed to confirm that stress mindset does indeed function via a mindset mechanism. This review has also argued that the most pressing area of research for stress mindset is the stability of stress mindset over time. As such, research should first focus on demonstrating that stress mindset is indeed stable over time before examining the other three proposed bodies of work.

Assessing the Stability and Construct Validity of Stress Mindset:
An Empirical Investigation

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Assessing the Stability and Construct Validity of Stress Mindset:

An Empirical Investigation

Stress can be broadly defined as a motivating force that encourages us to act upon our environment to overcome a barrier and achieve a goal (Salehi, Cordero, & Sandi, 2010). One in four Australians report having moderate to severe levels of stress, yet only one in five of these moderately-to-severely stressed Australians report that their stress negatively affects their wellbeing (Casey & Liang, 2014). Clearly, not everyone reports negative impacts of moderate to high levels of stress. This is supported by research demonstrating the existence of both positive (for a review see Linley & Joseph, 2004) and negative (for a review see Lupien et al., 2007) physiological and psychological effects of stress. Research has found that the beliefs people hold about stress may account for these different consequences of stress (Crum et al., 2013; Daniels et al., 2006; Guerra, Huesmann, Tolan, Van Acker, & Eron, 1995; Keller et al., 2012). One study reported that, of individuals experiencing severe levels of stress, those who believed that stress negatively affected their health were 43% more likely to die prematurely than those who believed that stress did not negatively impact their health (Keller et al., 2012). Additional to this, a longitudinal study conducted by Daniels et al. (2006) found that people who worked in teaching or human resources experienced greater negative affect with work-related stressors if they believed that stress increased negative affect, compared to those who did not believe that stress increased negative affect. One way that the link between stress and beliefs could be understood is through stress mindset (Crum et al., 2013). However, research into stress mindset is scarce, requiring further research to refine the theory.

In brief, stress mindset theory purports that our beliefs about stress influence the way we respond to and perceive stressful situations through a mindset mechanism (Crum et al., 2013). A mindset, generally, is a type of heuristic that influences how an individual perceives

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and responds to the subject of that mindset (Dweck, 2012). There are a number of different types of mindsets documented throughout the literature, such as the mindset about intelligence, which relates to how an individual perceives and responds to opportunities for further education (Dweck, 2008b), or the global mindset, which encapsulates how an individual perceives and responds to opportunities for cultural diversity (Murtha et al., 1998). Heuristics aid in information processing by applying rules and short-cuts to quickly arrive at decisions about information with minimal cognitive work (M. Eysenck & Keane, 2010; Gigerenzer & Todd, 1999). A mindset is a specific kind of heuristic that draws one's attention towards information from the environment that aligns with one's beliefs (Dweck, 2009). As a result, only information that is congruent with related beliefs will reach later cognitive processing (Dweck, 2008b, 2012).

A stress mindset is composed of many beliefs related to a particular subject (Dweck, 2012; Gupta & Govindarajan, 2002). As such, mindset research moves away from looking at individual beliefs in isolation, like that of Keller et al. (2012) or Daniels et al. (2006), and moves towards looking at the broader influence of beliefs, collectively, on behaviour. This collective nature is evident in the range of beliefs encapsulated in different mindsets. For instance, take the mindset about intelligence; this mindset embodies a set of beliefs about how much control an individual has over their intelligence (Dweck, 2010). If the individual believes they can increase their intelligence, they are said to have a 'growth mindset'. Individuals with a growth mindset also believe that scholastic work should be seen as a challenge, and believe that they will grow from overcoming this challenge (Dweck, 2010). These individuals also hold positive beliefs about mistakes, such as "mistakes are our friends" (Dweck, 2010, p. 2). However, if they do not believe that they can increase their intelligence, they are said to have a 'fixed mindset'. Individuals with this mindset believe that they are born with a fixed amount of intelligence. These individuals will also hold negative

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beliefs about difficult scholastic work and error making, in stark contrast to the beliefs held by those with a growth mindset (Dweck, 2006). Mindsets have also been shown to influence a range of behaviours, for example, research has demonstrated that mindsets can influence the judgements and evaluations made about overcoming problems and achieving goals (P. M. Gollwitzer, 1999; Taylor & Gollwitzer, 1995), and our ability to learn new behaviours (Dweck, 2006, 2008b, 2012). Furthermore, the more consistent these beliefs are with each other (e.g., an individual who holds a set of beliefs indicative of a growth mindset, whilst holding no beliefs indicative of a fixed mindset), the stronger the mindset will influence the individual (Dweck, 2012; Gupta & Govindarajan, 2002). This can be thought of like a continuum where each extreme represents a set of beliefs that are consistent with each other and where the middle of the continuum represents an equal balance of beliefs. As such, a growth mindset and a fixed mindset are the labels given to the two extremes of the mindset about intelligence's continuum (Donohoe et al., 2012).

Like the mindset about intelligence continuum, stress mindset theory also claims to function via a continuum whereby the two extremes of the continuum can be labelled as either an enhancing or a debilitating stress mindset (Crum et al., 2013). The enhancing stress mindset end of this continuum represents a pattern of positive beliefs whereby stress is viewed as a positive phenomenon from which there are potential gains, such as mastery or learning. Conversely, the debilitating stress mindset end of the continuum entails negative beliefs whereby stress is perceived as an undesirable phenomenon, from which there are potential losses, and thus should be avoided. It is thought that individuals holding debilitating stress mindsets are prone to perceiving themselves as being more stressed than those with enhancing stress mindsets (Crum et al., 2013). This is theorised to be the result of individuals with debilitating stress mindsets having a heightened anxiety towards becoming stressed. In turn, this anxiety causes these individuals to worry about becoming stressed; a worry that

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ultimately leads them to stressing over the first signs of becoming stressed (Crum et al., 2013). If stress mindset is directly related to anxiety and perceived stress, then the extent to which stress mindset is unique from these two stress-related constructs is questionable.

Crum et al. (2013) have demonstrated a number of weak relationships between stress mindset and a range of stress-related constructs to support the uniqueness of stress mindset from these stress-related constructs. These include resilience to stress, mindfulness, coping behaviours, tolerance to uncertainty, and the amount of stress the individual has experienced in the previous month (all correlation coefficients were $\leq .34$). This was accomplished in a cross-sectional study of employees from a large financial institution in the northern regions of the USA. These relationships found that people with a stress mindset towards the enhancing end of this continuum were more likely to be resilient to stress, be mindful, use problem-focused over emotion-focused coping strategies, be tolerant of uncertainty, and perceive themselves as less stressed compared to people with debilitating stress mindsets (Crum et al., 2013).

In a second study, Crum et al. (2013) manipulated the stress mindsets of employees from the same financial institution in northern USA. The study composed of three experimental conditions: i) an enhancing condition in which stress mindsets were manipulated towards the enhancing end of the stress mindset continuum; ii) a debilitating condition in which stress mindsets were manipulated towards the debilitating end of the stress mindset continuum; or, iii) a control condition in which stress mindset was not manipulated. Participants in the enhancing and debilitating conditions received three videos over a one-week period advocating either the enhancing or debilitating nature of stress, respectively. The participants' stress mindset was measured at baseline and one week after the intervention. This study demonstrated that shifting a person's stress mindset towards the enhancing end of the stress mindset continuum over the one week period improved overall wellbeing, whereas

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shifting a person's stress mindset towards the debilitating end of this continuum decreased overall wellbeing (Crum et al., 2013). Here, overall wellbeing was a single score that collectively represented three domains: depression, anxiety, and mood. Given that this aggregate score did not reflect the extent to which each distinct domain contributed to overall wellbeing, it is not possible to deduce whether the significant changes in overall wellbeing were equally represented across all three of these domains. As such, there is a need to address these three constructs independently, especially trait anxiety, as Crum et al. (2013) claim that debilitating stress mindsets will increase an individual's trait anxiety levels. This study will aim to explore this relationship between stress mindset and trait anxiety.

Additional to the need of disentangling the relationship of trait anxiety from the overall wellbeing construct used by Crum et al. (2013), the stress mindset literature lacks a thorough investigation of the uniqueness of this construct and its validity amongst other stress-related constructs. There are several constructs that theoretically should have some degree of overlap with stress mindset (Gregory, 2011). Three important constructs are perceived stress (Cohen, Kamarck, & Mermelstein, 1983), personality (Burgess, Irvine, & Wallymahmed, 2010; Ebstrup, Eplov, Pisinger, & Jorgensen, 2011), and emotional management (Mikolajczak, Luminet, & Menil, 2006). As such, it is of theoretical importance to investigate trait anxiety, perceived stress, personality, and emotional intelligence within the context of stress mindset. The relationship between stress mindset and each of these will each now be discussed in turn.

Distinguishing Stress Mindset from Other Related Constructs

It is well known that two people can encounter the same stressor and yet respond to it in very different ways (Lazarus & Folkman, 1984; Skinner & Brewer, 2002). Hence, not everyone will perceive the same stressor as being stressful (Novak et al., 2013; van Eck, Berkhof, Nicolson, & Sulon, 1996). This subjective view of stress is known as "perceived

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stress” (Cohen et al., 1983), and it is most commonly measured with the self-report Perceived Stress Scale, which assesses perceived stress over the previous month (Cohen et al., 1983). Psychologically, perceived stress has been associated with greater reported happiness (Schiffirin & Nelson, 2010) and optimism (Chang, 2007). Physiologically, individuals reporting greater perceived stress are more likely to develop diseases such as the common cold (Cohen, Tyrrell, & Smith, 1993), and chronic conditions such as Type 2 diabetes (Novak et al., 2013). These findings suggest that perceived stress is an important determinant of both mood and health, both of which have been suggested to relate to stress mindset.

Perceived stress was weakly and negatively correlated with stress mindset in the cross-sectional study by Crum et al. (2013). That is, individuals who perceived themselves as being less stressed endorsed a more enhancing stress mindset, and those perceiving themselves to be more stressed endorsed a more debilitating stress mindset. These findings provide preliminary support for the idea that people with debilitating stress mindsets will stress about being stressed and thus will report increased perceived stress levels (Crum et al., 2013). As this is the only empirical evidence to date to confirm this association between stress mindset and stress responses, more research is needed to confirm these findings with population samples and research contexts other than employees from a Northern American finance institution. An aim of the current study is to reproduce the weak negative correlations found by Crum et al. (2013) in a sample of adults from a variety of contextual settings.

Similar to perceived stress, another construct known to alter how people respond to stress is trait anxiety (M. Eysenck, Derakshan, Santos, & Calvo, 2007). According to Spielberger (1966), trait anxiety is an individual’s predisposition to feelings of apprehension, dread, and tension. Trait anxiety is another subjective construct, and is typically measured with the self-report State-Trait Anxiety Inventory (Spielberger, Gorsuch, & Lushene, 1970). This self-report scale assesses the extent to which individuals perceive themselves to have

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experienced feelings of anxiety over the previous month. Trait anxiety is thought to focus a person's attention on the threats and potential losses from environmental stimuli (M. Eysenck et al., 2007). Hence, an individual who is highly anxious is more likely to perceive a stressor as threatening (Britton, Lissek, Grillon, Norcross, & Pine, 2010) and to produce higher levels of stress hormones (such as cortisol) in the lead-up to a stressful event (Vedhara et al., 2003).

With evidence suggesting that trait anxiety can influence a person to fixate on the negative aspects of a stressor, it is to be expected that this would be associated with stress mindset such that individuals with an enhancing stress mindset will have lower trait anxiety than those with debilitating stress mindsets (Crum et al., 2013). The experimental manipulation study by Crum et al. (2013), in which participants received videos about either the enhancing or debilitating nature of stress, provided some support for this assumption by confirming that the shift in stress mindset towards an enhancing orientation led to greater overall wellbeing. However, the use of the composite measure of overall wellbeing, representing an aggregate of trait anxiety along with depression and mood, precludes any definitive conclusions being made about the direct association between trait anxiety and stress mindset. As such, more detailed investigations into this relationship are warranted. Given the evidence for trait anxiety being involved in the stress response (Britton et al., 2013; Britton et al., 2010; M. Eysenck et al., 2007; Skinner & Brewer, 2002), it is important to understand how stress mindset relates uniquely to trait anxiety.

Whereas trait anxiety focuses a person's attention on the negative aspects of an environmental stimuli, the construct of emotional management is thought to have the reverse effect, focusing a person's attention on the positive aspects of environmental stimuli (Mayer, Salovey, Caruso, & Sitarenios, 2003). Emotional management, an element of emotional intelligence, reflects an individual's ability to control their emotions (Mayer, Salovey, Caruso, & Sitarenios, 2003) and has previously been associated with the stress response

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(Mayer et al., 2003). Emotional intelligence is an umbrella term encapsulating a variety of cognitive skills required for the processing of emotional information (Mayer et al., 2003). These skills include the ability to perceive emotions accurately, to have emotion-facilitated thoughts, understand emotions, and control one's own emotions, also referred to as emotional management (Mayer et al., 2003; Petrides, 2009). Emotional management is said to act as an adaptive mechanism that helps an individual to act upon a situation, such as a stressor, within his or her environment (Syvante & Rahim, 2002).

Emotional management is known to influence the ways in which people respond to a stressor through three effects. Two studies in undergraduate psychology students have demonstrated that participants who reported having better control over their emotions (i.e., greater emotional management) were more likely to see the potential gains in completing a stressful mathematics task and speech task (Lyons & Schneider, 2005; Schneider, Lyons, & Khazon, 2013). Additionally, in their study of undergraduate psychology students, Lyons and Schneider (2005) demonstrated that greater emotional management was associated with better performance on the stressful mathematics and speech tasks. Finally, a study on medical physicians purported that physicians who reported greater emotional management also report a greater ability to manage their stress (Sotile & Sotile, 2003). The findings of these studies provide evidence for weak to moderate levels of association between emotional management and the way people respond to stressful situations (Lyons & Schneider, 2005; Schneider et al., 2013; Sotile & Sotile, 2003).

Similar to stress mindset theory (Crum et al., 2013), the construct of emotional management proposes a means by which an individual may be able to derive positive outcomes from stressors (Lyons & Schneider, 2005; Schneider et al., 2013). Stress mindset theory is yet to be directly compared to emotional management. Given the similar effects emotional management and stress mindset purport over the stress response, it is predicted that

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there will be a weak to moderate association between these variables such that greater emotional management would be associated with more enhancing stress mindsets. Due to the similarities of these constructs, a direct comparison of emotional management with stress mindset will help inform the construct validity of stress mindset.

The final construct that the current research will address is personality, encompassing the variety of dimensions that shape the way each person behaves (H. Eysenck, 1952). One dominant theory, the Big Five model of personality, divides personality into five broad dimensions including openness, conscientiousness, extroversion, agreeableness, and neuroticism (McCrae & Costa, 1987). Openness has been described as an individual's curiosity and his or her use of divergent thinking (that is, their ability to think creatively and "think outside of the box"; Feist, 1998). Conscientiousness is the ability to control one's impulses and is often associated with being goal-directed and the ability to delay gratification (Jackson et al., 2009). Agreeableness relates to an individual's desire to maintain positive relationships with those around them (Jensen-Campbell & Graziano, 2001). Extraversion refers to a predisposition to act in such a way as to attract social attention to oneself (Ashton, Lee, & Paunonen, 2002). Finally, neuroticism encapsulates the frequency of negative thoughts experienced by an individual (Schneider, 2004). The Big Five model purports that each person can be described by these five dimensions such that everyone has a measureable level of each dimension (Costa & MacCrae, 1992).

These five domains have been empirically related to the way an individual responds to stress in experimental task-induced stress studies (Matthews, Roberts, & Costa, 2006). Greater extroversion, conscientiousness, agreeableness, and openness have been associated with lower perceived stress, while higher neuroticism has been linked with higher perceived stress (Ebstrup et al., 2011). In both instances, the degree of association between the personality constructs and perceived stress has been of weak-to-moderate strength. Given that

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perceived (i.e., subjective) stress is associated with some consequences of stress (e.g., post-stress mood and health), and that personality influences perceived stress (Ebstrup et al., 2011), it is no surprise that personality has been shown to contribute to the range of outcomes an individual may experience while engaged with a stressor (Burgess et al., 2010; Ebstrup et al., 2011; Gallagher, 1990; Matthews et al., 2006).

This influence has been demonstrated to extend beyond merely *perceiving* a stressor as being stressful, to the way in which an individual *responds* to the stressor (Burgess et al., 2010; Connor-Smith & Flachsbart, 2007). For example, in a study on how nurses cope with the stressful environment of intensive care units, Burgess et al. (2010) found that greater openness, agreeableness, conscientiousness, and extraversion was shown to promote problem-oriented coping strategies, such as active coping (i.e., taking action to overcome the problem) and positive reframing (i.e., trying to see the problem in a positive light). On the other hand, a meta-analysis has noted that neuroticism decreases the use of a problem-focused coping style, and promotes a self-soothing response style that focusses on reducing feelings of anxiety, fear, embarrassment, and other negative affective states (Connor-Smith & Flachsbart, 2007).

Similar to emotional management, the Big Five model of personality provides a set of constructs that appear to influence the stress response, but which have not yet been compared directly with the stress mindset construct. Given that both stress mindset and personality have been reported to influence the level of perceived stress, it would be expected that, compared to debilitating stress mindsets, an enhancing stress mindset will be associated with greater openness, agreeableness, conscientiousness, and extroversion. Moreover, it is to be expected that greater neuroticism would be more strongly associated with debilitating stress mindsets than enhancing stress mindsets.

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This paper has identified four stress-related constructs (perceived stress, trait anxiety, emotional intelligence, and personality) that should theoretically relate to stress mindset for which empirical verification is lacking. Another aspect of stress mindset research for which there is a lack of empirical evidence is the assumption that a mindset is stable over time (Gupta & Govindarajan, 2002); however, this has not yet been empirically verified in the specific case of a stress mindset. Generally speaking, mindsets are driven by a collection of beliefs (Dweck, 2006) that are said to be relatively stable across time, and not modifiable without direct intervention (Watson & Tharp, 2007). There is empirical evidence to suggest that beliefs do not generally change over time. Studies across a number of contexts support this view, including investigations of beliefs about mathematics (for a review, see Liljedahl, Oosterle, & Bernèche, 2012), medical and health advice (Porteous, Francis, Bond, & Hannaford, 2010), and stress (Daniels et al., 2006; Keller et al., 2012; Watson & Tharp, 2007). One of the longest studies on belief stability was that of Porteous et al. (2010) who demonstrated that, in their study of over 3000 Scottish adults on the Scottish electoral roll, beliefs about medical and health advice were stable for up to four years.

This stability is thought to stem from the inherent predisposition of individuals to involuntarily focus on, and search for, information that confirms their beliefs (Watson & Tharp, 2007), much like the self-fulfilling prophecies described by Merton (1948). As such, for individuals to change their mindset, it will require them to undergo a conscious shift in the information on which they focus, leading to a gradual change in beliefs (Watson & Tharp, 2007). Research into mindsets, other than stress mindset, provides evidence that this selective focussing of attention caused by a set of beliefs constitutes the mechanism by which mindsets operate (Dweck, 2008b; P. Gollwitzer, 2012; Javidan et al., 2007; Taylor & Gollwitzer, 1995). In other words, a mindset should not change if the underlying beliefs remain constant. As such, in the absence of a specific intervention to modify beliefs, stress mindset should be

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stable over a period of time. Preliminary support for this prediction was indirectly provided in the manipulation study Crum et al. (2013) whereby individuals assigned to the control condition, which received no manipulation of beliefs, demonstrated stability over a one week duration. Clearly, a more extensive, longer term assessment of the stability of stress mindset over time is required to draw any firm conclusions about the stability of this construct.

In summary, stress mindset is a novel construct that has been demonstrated to influence the way in which an individual responds to stress on both a cognitive and physiological level (Crum et al., 2013). Stress mindset theory is still very much in its infancy, and there remains inadequate evidence to support its construct validity. Previous attempts to verify stress mindset as a unique construct have been limited by the range of other constructs to which stress mindset has been compared. Furthermore, these attempts have had a number of methodological limitations (e.g., anxiety being measured as one of several components collectively referred to as ‘overall wellbeing’), preventing a more thorough understanding of the relationship between these variables and stress mindset (Crum et al., 2013). Other theories and models that are related to the stress response, such as personality (H. Eysenck, 1952) and emotional management (Mayer et al., 2003), have not yet been directly compared to stress mindset. Another limitation of the existing stress mindset evidence base is the paucity of data concerning the mindset mechanism that has been theorised to drive stress mindset, particularly the presumed stability of a mindset over time.

The aim of this research was to extend the initial investigations into stress mindset (Crum et al., 2013) by providing further evidence for the validity of this construct, and addressing the assumption of invariance over time. Specifically, the primary aim of this study was to delineate the relationship between stress mindset and i) personality, ii) emotional management, iii) perceived stress, and iv) trait anxiety. A secondary aim was to assess stress mindset over time to test the assumption of stability for this construct. It was hypothesised

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that individuals with a stress mindset towards the enhancing end of the stress mindset continuum will report being more conscientious, extraverted, agreeable, and less neurotic, anxious, and stressed, compared to those with a debilitating stress mindset. It was also hypothesised that the degree of association of stress mindset with these variables would be of weak to moderate strengths, as was demonstrated in prior research. Finally, it was hypothesised that stress mindset would remain stable over a period of one month.

Method

Participants.

This study recruited participants from four main populations. First year psychology students were recruited from an online participant pool at Macquarie University, Sydney, Australia. Additionally, members of online communities based in Australia, the United States (USA), and the United Kingdom (UK) were also recruited into this study. Multiple countries were used to maximise sample size and generalisability. All participants were over the age of 18 years and self-reported having no current diagnosis of any psychological or stress related disorders. Sixty-one students enrolled in first year psychology units at Macquarie University were recruited from the online participant pool. These students agreed to participate in the study in exchange for course credit. Students were invited into the study via an advertisement posted on the Macquarie University Psychology Participant Pool (www.mq-psy.sona-systems.com; see Appendix A1 for the student's advertisement). Members of online communities were recruited from online participant pools (such as, <http://psych.hanover.edu/research/exponnet.html>, <http://www.onlinepsychresearch.co.uk/>, and <http://www.psychstudies.co.uk/index.php>; for a full list of websites, see Appendix B) where the invitation to participate in the study was posted on each website (see Appendix A2 for the community samples advertisement). Sixty-two members of online communities (Australia = 38, USA = 17, UK = 7) agreed to participate in exchange for the opportunity to enter a draw

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to win one of 15 gift vouchers to the value of \$100 AUD paid in the participants local currency.

In total, 123 participants consented to participate in this study (101 females, 81.5%; 22 males, 18.5%) ranging in age from 18 to 73 years (*Mdn* = 20 years, *IQR*: 18-26 years). Twenty-one participants (17%) consented but did not complete the one week follow-up, and a further 15 participants (12%) completed the one week follow-up, but not the one month follow-up. This left a final sample size of 102 participants with complete data at the one week follow-up (with a 17% drop out rate from baseline), and 87 at the one month follow-up (with a 29% drop out rate from baseline). This research was approved by the Macquarie University Human Research Ethics Committee (Reference number: HREC 5001500090; see appendix C for approval letter).

Procedure

Baseline. All participants provided informed consent online (see appendices D1 to D4) before they completed a demographics questionnaire documenting age, gender, and highest education level attained. Following this, participants completed a battery consisting of the trait subscale of the State Trait Anxiety Inventory (Spielberger et al., 1970), the Perceived Stress Scale (Cohen et al., 1983), the self-control subscale of the Trait Emotional Intelligence Questionnaire (to measure emotional management; Petrides & Furnham, 2006), and the Ten-Item Personality Inventory (Gosling, Rentfrow, & Swann, 2003), and a Stress Mindset Measure was completed (Crum et al., 2013). All surveys were presented in random order (see Appendix E for the full questionnaire).

The one week, and one month follow-up assessments. The two follow-up assessment points were identical to baseline in every way, except that further consent was not required. Participants completed all five measures in random order at each follow-up. The data for stress mindset at all three time points will be reported on in this paper. However, this

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paper will only report on the baseline data for personality, emotional intelligence, perceived stress, and trait anxiety. The one week and one month data for these four variables were collected for another study.

Measures

Perceived stress. The Perceived Stress Scale measures the participants self-reported levels of stress over the previous month (Cohen et al., 1983). This scale has been used extensively (e.g., Cohen et al., 1993; van Eck et al., 1996; Warttig, Forshaw, South, & White, 2013), has been independently validated (Lee, 2012), and has previously demonstrated excellent internal reliability ($\alpha = .85$; Cohen et al., 1983). Participants indicated their agreement with 14 statements on a 5-point Likert-type scale from 0 (*Never*) to 4 (*Very often*). An example of one item is, “In the last month, how often have you been upset because of something that happened unexpectedly?” Scores were summed with items 4, 7, 9, 10, and 13 reverse scored. Possible scores range from 0 to 56 with higher scores representing a greater level of perceived stress. The current study demonstrated acceptable internal reliability for this measure ($\alpha = .88$).

Trait anxiety. The trait anxiety subscale of the State-Trait Anxiety Inventory assesses general anxiety levels (Spielberger et al., 1970). This scale previously demonstrated excellent internal reliability ($\alpha = .88$, Barnes, Harp, & Jung, 2002). Participants indicated their agreement with 20 statements such as “I am a steady person”. All responses were rated on a 4-point Likert-type scale from 1 (*Not at all*) to 4 (*Very much*). Items 1, 3, 6, 7, 10, 13, 14, 16, and 19 were reverse coded. Scores were summed to generate a total trait anxiety score with higher scores representing greater trait anxiety. The possible range of scores was from 20 to 80. The current study demonstrated acceptable internal reliability ($\alpha = .93$).

Emotional Management. The Self-Management subscale of the Trait Emotional Intelligence Questionnaire – Short Form (Petrides & Furnham, 2006) measured the

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participants perceived emotional management ability. This measure has previously demonstrated good internal reliability ($\alpha = .72$, Petrides, 2009). Participants rated the extent of their agreement with six statements on a 7-point Likert-type scale ranging from 1 (*Completely disagree*) to 7 (*Completely agree*). An example of one item is “I tend to change my mind frequently”. Items 1, 2, and 5 were reversed scored. A mean score was calculated with a possible range of 1 to 7. Higher scores represented a greater perceived control over one’s emotions. The current study demonstrated acceptable internal reliability ($\alpha = .75$).

Personality. The Ten Item Personality Inventory was used to assess openness, conscientiousness, extraversion, agreeableness, and neuroticism (Gosling et al., 2003). This 10-item measure produces a subscale for each of the Big Five personality domains. Participants rated their agreement with the 10 statements on a 7-point Likert-type scale from 1 (*Disagree strongly*) to 7 (*Agree strongly*). An example of one item is “I see myself as extraverted and enthusiastic”. Items 2, 4, 6, 8, and 10 were reversed scored. Scores for each subscale were summed to yield a possible score from 1 to 14 with higher scores indicating a greater endorsement of the specific personality trait represented by each sub-scale, except neuroticism. For neuroticism, higher scores represented *less* neuroticism. The subscales of the brief inventory used in the present research have previously demonstrated acceptable content validity with the Revised NEO Personality Inventory (Gosling et al., 2003). The brief measure was selected for the purposes of the present research to reduce the time taken to complete the study, as most alternative personality measures entail lengthy assessments (e.g., the 44-item Big-Five instrument constructed in 1999 by John & Srivastava). Unfortunately, a number of subscales of this measure failed to demonstrate acceptable levels of internal reliability, specifically agreeableness ($\alpha = .38$), openness ($\alpha = .44$), and conscientiousness ($\alpha = .57$). Both extraversion ($\alpha = .72$), and neuroticism ($\alpha = .71$) demonstrated acceptable internal reliability. However, Gosling et al. (2003) recommend that test-retest is a better

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indicator of internal reliability for these subscales due to the subscales having only two items per scale. Field (2013) argues that correlations larger than .60 are considered signs of acceptable test-retest reliability for scales with a restricted number of items. Based on this, all subscales demonstrated acceptable test-retest reliability from baseline to one week in the present study ($r's \geq .66$).

Demographics. Participants provided information relating to their age, gender, and highest level of education. This information was used to assess any systematic differences across the samples and stress mindset. These systematic differences were controlled for in later hypothesis tests.

Stress mindset. The primary outcome of this study was stress mindset. The Stress Mindset Measure assesses an individual's beliefs about the nature of stress (Crum et al., 2013). This measure has previously demonstrated excellent internal reliability ($\alpha = .86$; Crum et al., 2013). Participants indicated their agreement with each of the eight statements on a 5-point Likert-type scale from 0 (*Strongly disagree*) to 4 (*Strongly agree*). For example, "The effects of stress are negative and should be avoided". Mean scores (ranging from 0 to 4) were calculated with items 1, 3, 5 and 7 reversed. Scores above two represent an enhancing stress mindset, in which the mindset is informed primarily by positive beliefs. Scores below two represent a debilitating stress mindset, similar to above, the mindset is characterised primarily by negative beliefs. A score of two represents a stress mindset that is equally characterised by positive and negative beliefs. The Stress Mindset Measure demonstrated acceptable internal reliability in the current study ($\alpha = .87$).

Statistical Analysis

All analyses were conducted with SPSS version 22 (IBM, 2013). Descriptive analyses were utilised to produce means, standard deviations, skew, and kurtosis statistics for all continuous variables. Since the age variable was strongly positively skewed, the median and

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interquartile range are reported as means and standard deviations would not describe the variable adequately (Howell, 2013). Frequencies are reported for categorical variables.

Participant's scores on all variables were compared between participants who dropped out of the study, and participants who did not drop out of the study. All baseline variables were then compared across the participants' country of residence (community sample only).

Comparisons were made by ANOVAs for continuous variables, chi-square tests for categorical variables, and a non-parametric Kruskal-Wallis H test for age. Differences found between countries were controlled for in later hypothesis tests. Due to the small sample of UK and USA participants, the three countries were combined to generate a global sample.

This sample was then compared to the first year psychology student sample on all variables by means of independent samples t -tests for continuous variables, chi-squares for categorical variables, and a non-parametric Mann-Whitney U test for age. Differences between these two samples were also held constant in later hypothesis tests. These two samples were then combined to produce the final sample. Correlations were then run on the combined sample between all variables to identify demographics that related to stress mindset and thus what would need to be controlled for in later hypothesis tests, as well as to assess the relationship between all variables.

To assess the construct validity of stress mindset, individual multiple linear regressions were conducted on stress mindset for each predictor (trait anxiety, perceived stress, emotional management, and the five personality domains), controlling for demographics that systematically changed between sample source and country of residence. Convergent validity was defined as a weak to moderate ($\beta \leq .60$) significant relationship between a predictor and stress mindset based on previous stress research (Britton et al., 2010; Crum et al., 2013; Ebstrup et al., 2011; Lyons & Schneider, 2005). A power analysis using G*Power (version 3.1.9.2; Faul, Buchner, Erdfelder, & Lang, 2014) indicated that each

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regression, containing one predictor and a number of covariates, required a sample size between 55 to 159 participants to achieve a power of .80 for a Type I error rate of $\alpha = .05$ with an expected weak to moderate effect size.

Construct stability was evaluated with two multiple linear regressions with stress mindset at one week and at one month were each regressed onto stress mindset at baseline in separate multiple linear regressions, controlling for demographics that systematically changed between sample source, country of residence, and stress mindset. A repeated measures ANOVA was utilised to assess whether stress mindset scores were significantly different between assessment points (i.e., baseline, one week, and one month). Stability was defined as a strong ($\beta \geq .70$) relationship between time points, with no significant differences between any of the time points. A power analysis using G*Power (version 3.1.9.2; Faul et al., 2014) indicated that each regression, containing one predictor and a number of covariates, required 25 participants to achieve a power of .80 for a Type I error rate of $\alpha = .05$ with a strong effect size. Statistical significance was defined as $p < .05$ for all tests in this study. Given that power was still achieved after accounting for the number of participants who dropped out at each time point no attempts were made to estimate the missing data.

Results

Normality

Normality was defined as a standardised skewness or standardised kurtosis statistic between +1.96 and -1.96, as recommended by McQueen and Knussen (2006). The results of this analysis can be found in Appendix F. In short, all variables were normally distributed except for age, which was strongly leptokurtic with a strong positive skew (skew = 2.36, $SE = 0.22$, standardised skew = 10.73; kurtosis = 6.22, $SE = 0.43$, standardised kurtosis = 14.47).

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Comparing Dropouts to Completers

Comparisons of participants who completed all surveys to those who dropped out across baseline characteristics indicated that individuals were more likely to drop out if they were from the USA participant pool, whereas those from the Australian participant pool were most likely to complete all three surveys ($\chi^2 = 37.06, p < .0005$). Community members were more likely to drop out of the study than first year psychology participants ($\chi^2 = 23.00, p < .0005$). No other differences were evident between those who did and did not complete all three surveys.

Descriptives

Overall, participants were mostly in their early 20s, female, and had either completed high school or an undergraduate degree (See Table 1). They reported moderate levels of perceived stress, trait anxiety, and emotional management, and relatively high levels of extraversion, agreeableness, conscientiousness, and openness, with relatively low levels of neuroticism. Finally, participants were mostly endorsing stress mindsets towards the debilitating end of the stress mindset continuum at all three time points. ANOVAs revealed no difference between any of the variables across country of residence for the global sample (see Appendix G).

Table 1 also displays the results of all comparisons between the global sample and first year psychology student sample. The community sample was found to be significantly older than the first year psychology student sample, and to have achieved a higher level of education than the first year psychology student sample. The community sample also reported having greater emotional management than the first year psychology student sample. There were no other significant differences between the community sample and the first year psychology participant sample. As such, age and education were controlled for in all

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analyses, and sample source was controlled for in the multiple linear regression containing the baseline emotional management scores.

Table 2 displays the correlation results between all baseline measures. These correlations revealed that stress mindset at baseline negatively related to trait anxiety and perceived stress at the bivariate level. Furthermore, these analyses revealed that stress mindset at baseline positively related to neuroticism, openness, and emotional management at the bivariate level. Given that agreeableness, extraversion, and conscientiousness did not correlate with stress mindset, there is no need to conduct the multiple linear regressions on these variables.

Construct validity

All predictors that correlated with stress mindset at $p < .10$ were regressed onto baseline stress mindset scores controlling for age and education. Specifically, these included perceived stress, trait anxiety, emotional management, openness, and neuroticism. The results for predictors of all regressions are provided in Table 3 (See Appendix H for the results of control variables and predictors). Trait anxiety negatively related to stress mindset with a weak to moderate strength. Perceived stress negatively related to stress mindset with moderate strength. Emotional management positively related to stress mindset with moderate strength. For personality, neuroticism positively related to stress mindset with moderate strength, and openness positively related to stress with weak strength. As such, stress mindset has satisfied the specified criteria for construct validity with the majority of constructs included in this study.

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Table 1

Descriptives for the whole sample, the global sample, and first year sample

	Whole sample		Global		First year			
	(N = 123)		(n = 62)		(n = 61)			
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>t/χ²</i>	<i>p</i>
Age (<i>Mdn, IQR</i>)	20	18-27	23	20-30	18	18-20	714.00	<.001
Female (<i>n, %</i>)	101	82.11	51	82.26	50	81.97	0.02	.884
Education (<i>n, %</i>)							30.82	<.001
Some high school	3	2.44	2	3.23	1	1.64		
Finished high school	76	61.79	24	38.71	52	85.25		
Undergraduate	34	27.64	26	41.94	8	13.11		
Postgraduate	9	7.32	9	14.52	0	0.00		
Doctorate	1	0.81	1	1.61	0	0.00		
Trait anxiety	44.57	10.95	44.70	11.10	44.44	10.87	0.13	.896
Perceived stress	23.58	8.40	22.81	8.91	24.38	7.82	-1.04	.300
Extraversion	7.70	3.15	7.85	3.23	7.54	3.09	0.54	.590
Agreeableness	10.15	2.12	10.18	2.14	10.13	2.12	0.12	.908
Conscientiousness	10.30	2.50	10.23	2.50	10.36	2.53	-0.28	.777
Neuroticism	8.52	3.10	8.64	3.21	8.38	2.30	0.48	.636
Openness	10.03	2.54	9.73	2.81	10.33	2.21	-1.31	.164
EM	4.32	1.03	4.51	1.07	4.14	0.95	2.03	.045
Stress mindset baseline	1.84	0.72	1.83	0.79	1.92	0.79	0.30	.762
Stress mindset one week	1.91	0.72	1.91	0.73	1.91	0.71	-0.07	.947
Stress mindset one month	1.87	0.79	1.83	0.79	1.92	0.79	-0.71	.476

Note. EM = emotional management.

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Table 2

Correlations between stress mindset and construct validity predictors at baseline.

	1	2	3	4	5	6	7	8
1. Stress mindset	-							
2. Trait anxiety	-.38****	-						
3. Perceived stress	-.38****	.83****	-					
4. Extraversion	.12	-.31***	-.28**	-				
5. Agreeableness	.10	-.29***	-.26**	-.14	-			
6. Conscientiousness	-.05	-.31****	-.24**	.06	.10	-		
7. Neuroticism	.37****	-.81****	-.76****	.33****	.29***	.13	-	
8. Openness	.26**	-.26**	-.21*	.24**	.09	.10	.21*	-
9. Emotional management	.36****	-.75****	-.74****	.23*	.30****	.16†	.78****	.09

† $p < .10$. * $p < .05$. ** $p < .01$. *** $p < .001$. **** $p < .0005$.

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Table 3.

Results of the multiple linear regressions for stress mindset.

					95% CI		
	<i>b</i> (<i>SE</i>)	<i>B</i>	<i>F</i> ^a	<i>p</i>	<i>LL</i>	<i>UL</i>	<i>partial</i> η^2
Perceived Stress	-0.03(0.01)	-0.43	26.29	<.0005	-0.04	-0.02	0.18
Trait Anxiety	-0.04(0.01)	-0.44	80.26	<.0005	-0.05	-0.02	0.18
EM*	0.29(0.06)	0.40	21.83	<.0005	0.17	0.41	0.16
Openness	0.08(0.03)	0.29	9.54	.003	0.03	0.13	0.08
Neuroticism	0.10(0.02)	0.41	22.29	<.0005	0.06	0.14	0.16

Note. DV: Stress Mindset scores at baseline. Each line represents a separate regression controlling for age and education. EM = emotional management. * controlling for age, education, and sample source.

Construct stability

Stress mindset at baseline was regressed onto stress mindset scores at one week and at one month in separate multiple linear regressions controlling for age and education (See Table 4 for the results of predictors; See Appendix I for the results of all control variables and predictors). These regressions revealed that stress mindset at baseline strongly predicted stress mindset scores at both the one week and one month time points. Moreover, a repeated measures ANOVA revealed no significant differences in stress mindset scores across the three time points, $F(2, 170) = 1.42, p = .245$. As such, stress mindset appears to satisfy the a priori requirements of construct stability in this study.

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Table 4.

Construct stability

				95% CI		
	<i>b</i> (<i>SE</i>)	<i>B</i>	<i>p</i>	<i>LL</i>	<i>UL</i>	<i>partial</i> η^2
Stress mindset one week	0.84(0.05)	0.84	<.0005	0.74	0.94	0.70
Stress mindset one month	0.83(0.07)	0.77	<.0005	0.70	0.96	0.59

Note. Each row represents one dependent variable of a multiple linear regression. Predictors included stress mindset scores at baseline, age and education. Statistics reported in the table are for stress mindset scores at baseline.

Discussion

The present study aimed to extend the existing stress mindset literature by providing further evidence for the construct validity and construct stability of stress mindset. Regarding construct validity, this study assessed the degree of association of stress mindset with other stress-related constructs, including perceived stress, trait anxiety, emotional management, and the Big Five domains of personality. It was expected that stress mindset would be positively associated with emotional management (Schneider et al., 2013) and openness, conscientiousness, extroversion, agreeableness, and neuroticism (Ebstrup et al., 2011). It was also expected that stress mindset would be negatively associated with trait anxiety (Skinner & Brewer, 2002) and perceived stress (Crum et al., 2013). There was partial support for these hypotheses, with the expected weak to moderate strength associations between stress mindset and perceived stress, emotional management, and trait anxiety evident. However, only openness and neuroticism related to stress mindset in the expected direction and strength, yet conscientiousness, agreeableness, and neuroticism did not relate to stress mindset at all. In addition to this assessment of construct validity in stress mindset, this study also assessed the

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assumption that a mindset is stable across time. This is one of the four criteria proposed in the preceding literature review as a defining characteristic of a mindset. There was strong support for this prediction as stress mindset at baseline was shown to strongly predict stress mindset at both the one week and the one month follow-up assessments. Moreover, the participants' stress mindset scores did not significantly change over this period of time.

Construct Validity

Perceived stress, the subjective perception of stress levels over the previous month (Cohen et al., 1983), was expected to negatively relate to stress mindset such that greater perceived stress would be associated with a more debilitating stress mindset; this prediction was supported across all samples in this study. This is consistent with previous stress mindset research by Crum et al. (2013) and demonstrates the generalisability of the negative relationship between perceived stress with stress mindset across multiple populations and contexts. This is also consistent with the assumption proposed by Crum et al. (2013) that individuals with debilitating stress mindsets stress about becoming stressed. However, without an objective quantification of how much stress each individual has experienced, and without experimental manipulations of participants' stress mindsets, it is impossible to deduce whether individuals with a debilitating stress mindset truly stress themselves out, or if they genuinely experience a greater number of stressful situations compared to those with a stress mindset towards the enhancing end of this spectrum.

In addition to perceived stress, this study also examined trait anxiety. Crum et al. (2013) measured trait anxiety as one of three constructs that were combined to produce a single overall wellbeing score, which prevented the delineation of the specific relationship of trait anxiety with stress mindset. The present study addressed this by directly assessing the trait anxiety-stress mindset relationship. As predicted, trait anxiety was negatively associated with stress mindset with a similar magnitude of association as documented in previous stress-

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based research (Matthews et al., 2006; Vedhara et al., 2003). As expected, trait anxiety negatively related to stress mindset as suggested by the results of the overall wellbeing measured used by (Crum et al., 2013). This finding adds to the construct validity of stress mindset by disentangling the relationship between stress mindset and trait anxiety from that of the other two components (depression and mood) included in the overall wellbeing aggregate construct of Crum et al. (2013).

These findings suggest that individuals with a more debilitating mindset are more likely to experience a greater level of anxiety in day-to-day life, compared to individuals with more enhancing mindsets. As the stress mindset manipulation conducted by Crum et al. (2013) suggested that shifting an individual's mindset towards the enhancing end of the stress mindset continuum also improved overall wellbeing, it is possible that this improvement in overall wellbeing included an improvement in trait anxiety, given the relationship found in the present study.

Emotional management has been previously demonstrated to relate to the stress response such that greater emotional management has been associated with an increased number of perceived potential gains in a stressor (Schneider et al., 2013), an increased performance on stressful tasks (Lyons & Schneider, 2005), and an increased resilience to stress (Sotile & Sotile, 2003). However, there has been no research to date to confirm the construct validity between emotional management and stress mindset. The present study explored this relationship and found a positive relationship between stress mindset and emotional management, a relationship that bore a similar strength as in previous stress-based research (Lyons & Schneider, 2005; Schneider et al., 2013; Sotile & Sotile, 2003).

These findings suggest that individuals with a more enhancing stress mindset are more likely to express greater control over their emotions than those with a debilitating stress mindset. As such, this finding adds to the construct validity of stress mindset by confirming

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that this stress-related construct shares a similar relationship with stress mindset as it does with other stress-based constructs, such as challenge appraisals (Lyons & Schneider, 2005). However, it is not possible from these cross-sectional data to ascertain the direction of causality between emotional management and stress mindset. Evidently, further experimental testing is required.

The present study adopted the Big Five model of personality, which suggests that each person ranges on levels of openness, conscientiousness, extraversion, agreeableness, and neuroticism. In the present study, it was predicted that greater levels of all these domains, except neuroticism, would be associated with a more enhancing stress mindset. For neuroticism, the reverse was predicted whereby higher neuroticism would be associated with a more debilitating stress mindset. The present study found evidence in support of openness and neuroticism relating to stress mindset in the expected directions. However, conscientiousness, extraversion, and agreeableness bore no relationship to stress mindset.

These findings suggest that an individual with a debilitating stress mindset is more likely to report greater neuroticism and less openness compared to those with an enhancing stress mindset. However, these findings also suggest that conscientiousness, extraversion, and agreeableness do not change with stress mindset, against predictions. Why these three domains did not relate to stress mindset in the present study, but did relate to other stress-based constructs in prior research can only be speculated. Interestingly, the five personality domains did relate to perceived stress in the present study in a similar fashion to the studies by Ebstrup et al. (2011) and Matthews et al. (2006). This suggests that, while the Big Five personality domains do relate to perceived stress, they may not relate to stress mindset. Other studies addressing personality and stress-related constructs other than perceived stress, such as coping (Bouchard, 2003), stress appraisals (Gallagher, 1990; Schneider, 2004), and biological stress responses (Wirtz et al., 2007), have shown a more nuanced relationship

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between stress and personality; such that only a portion of the Big Five domains of personality related to the stress response. As such, it may be that the role of personality in stress mindset is more nuanced than a simple overarching theory that greater amounts of all domains, except neuroticism, results in more favourable stress-related outcomes. It may be that each stress construct relates to personality differently.

An alternative explanation for the mixed findings of this present study may be that this reflects the measure of personality utilised. The Ten-Item Personality Inventory was specifically selected to reduce participant burden. However, this measure only uses two items per personality construct to measure each domain (Gosling et al., 2003), and for the present study the internal reliability of most subscales was sub-optimal. Future research in this area should use a more reliable, and comprehensive, measure of personality, such as the 44-item Big Five Personality Inventory (John & Srivastava, 1999). If such a study produced similar findings to the present study, then this would be evidence for both the nuanced relationship between stress mindset and personality, as well as support for the usefulness of the Ten-Item Personality Inventory in research.

Construct Stability

This study proposed that a mindset, be it based on stress, intelligence, or otherwise, should demonstrate stability over time. This assumption had not been demonstrated in stress mindset beyond a one week period. Thus, the present study sought to observe stress mindset scores over a period of one month. It was found that stress mindset was stable over the one month period, suggesting that an individual who held an enhancing stress mindset at the first survey would hold the same (or very similar) stress mindset at both the one week and one month follow-up assessments. These findings provide preliminary support for the short-term stability of the stress mindset construct. Future research in this area is needed though to determine whether the stability is sustained over a longer period and whether an experimental

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manipulation of stress mindset, similar to Crum et al. (2013), can induce changes in stress mindset not only in the short term, but also in the longer term. Consistent with the assumption of mindset stability, it would be expected that, after a stress mindset manipulation like that of Crum et al. (2013), stress mindset would revert back to the original stress mindset level in time, without any further ongoing training or intervention.

Limitations and Future Research

The findings of this study need to be considered in light of some limitations. As this study was correlational and contained no manipulation of stress mindset, it was impossible to ascertain whether stress mindset influences or is influenced by any of the constructs measured for construct validity. Given that, for the most part, this study has demonstrated construct validity as hypothesised. Future research should aim to manipulate stress mindset to understand exactly how stress mindset relates with these variables. Such a study could utilise the short video based intervention used by Crum et al. (2013) to shift stress mindset towards the extremes of being enhancing or debilitating and track any coinciding changes in perceived stress, trait anxiety, or emotional management that accompany the change in stress mindset.

Another limitation of the present study is that the measure of personality was very brief and demonstrated less than optimal internal reliability, indicating the need for future research in this area to utilise a more reliable and comprehensive scale for assessing personality dimensions. While the brief measure utilised has been found to correlate with the more comprehensive revised NEO personality inventory (Costa & MacCrae, 1992) to a similar degree as other more comprehensive short-form personality measures (Gosling et al., 2003), the lack of internal reliability found in the present study questions the reliability of such findings.

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In addition, the construct stability aspect of this research was measured over only a single month. It is possible that participants were able to remember how they responded on previous surveys, potentially introducing a response bias. The random presentation of measures in this study was designed to minimise such bias, but a longer follow up is recommended for future research to ensure that participants were not merely responding in a similar fashion to previous surveys due to test familiarity. As such, while a one month follow up is a great improvement on previous stress mindset research by Crum et al. (2013), a longer follow-up period would provide stronger evidence of the stability of stress mindset.

Finally, the study was slightly underpowered. Pre-investigation power analyses determined that 159 participants were required in order to have sufficient power to detect small effects (i.e., in the vicinity of detecting partial $\eta^2 = .03$) in the multiple linear regression analyses concerning the construct validity of stress mindset. The final analysable sample was 123 participants. However, even with a substantially larger sample (e.g. $N = 1000$), the very small level of association evident between stress mindset and agreeableness, conscientiousness, and extraversion would still not have been detectable. This suggests that the non-significant findings here were not due to a lack of power, but were due to a lack of association between stress mindset and these personality domains.

In light of the above limitations, this study has still produced interpretable findings that have implications for both clinical professionals as well as researchers. First, this study has improved the level of detail known about stress mindset through examining the construct validity of stress mindset with a number of other constructs. This provides a basis from which researchers can further examine the causal influence of stress mindset on these constructs. For psychologists, knowing the characteristics associated with an individual who holds negative beliefs about stress, compared to individuals who hold positive beliefs about stress, will aid in their understanding of the context of their clients. Knowing that individuals who

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hold negative beliefs about stress are more likely to also hold greater levels of trait anxiety, experience greater levels of perceived stress, and report lower control over their emotions, may help in treatment formulation.

The preliminary findings into the stability of stress mindset suggest a number of potential implications for both clinical professionals and researchers that will come to full fruition with continued research. For researchers, there is a need to explore other observable characteristics of a mindset, to confirm that stress mindset is indeed the result of a mindset, and not the result of another cognitive process. These include the range of beliefs encapsulated in stress mindset, the causal influence of stress mindset on stress-related constructs (such as perceived stress, trait anxiety, emotional management, coping, etc), and the formulation of effective stress mindset-based psychological interventions. For clinicians, the prospect of stress mindset being stable over time suggests that individuals presenting with a range of negative beliefs about stress may not dissipate on their own accord, treatment plans may need to consider this. The implementation of cognitive-based therapies, such cognitive-behavioural therapy (Meichenbaum, 1977), may prove a viable option for improving an individual's stress mindset. However, the effectiveness and appropriateness of any treatment is still in need of scientific enquiry. Moreover, such treatments would only be necessary if improving a stress mindset is shown to make clinically relevant improvements in constructs of clinical interest, such as anxiety or depression.

Conclusion

This study has improved on previous stress mindset research by extending the construct validity of stress mindset to include trait anxiety, emotional management, and personality. Here, a more enhancing stress mindset was associated with greater emotional control and openness, and lower neuroticism and trait anxiety. However, stress mindset was not related to openness, agreeableness, or extraversion, against predictions. Moreover, this

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study has replicated the relationship between stress mindset and perceived stress reported in Crum et al. (2013), confirming that stress mindset in the present study is relating to the stress response in a similar fashion to that of Crum et al. (2013). Finally, this study has demonstrated that stress mindset is indeed a stable construct, at least over the period of one month. As such, stress mindset has demonstrated both construct validity and construct stability as expected, for the most part.

Future research can now expand upon these findings, further exploring the intricacies of stress mindset. The next step in this research is to examine the other three criterion by which a mindset can be defined, each of which represent their own body of empirical investigation. That is, the breadth of appropriate stress-related beliefs encapsulated in the stress mindset theory, the influence of stress mindset on how we perceive and respond to stressful situations, and finally, the development of interventions that can be applied to produce lasting changes on a person's stress mindset. From a clinical perspective, this research has the potential to inform practice and treatment approaches.

Although the research into the field of stress mindset is still quite scarce, this field is starting to gain momentum. Research is heading towards is examining stress mindset under different settings and scenarios. Greater knowledge about how this construct functions, how it can be used to improve general wellbeing, and how it relates with other stress-related constructs is coming into light. With each new study, it would seem that the secret to coping with stress is *not to stress less, but to stress healthier*.

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APPENDICES*Appendix A*

Advertisements

A1 - First Year Psychology Participant Advertisement:

“How do you stress? Stress beliefs over time”

We are seeking participants who are free of psychological and/or stress related disorders to complete three 15 minute online studies across the next month (today, in one week’s time, and in one month’s time) in exchange for 1.5 credits (0.5 credits per survey). These studies are looking at how our beliefs about stress change over time. In all three studies participants will complete a range questionnaires. The questionnaires will look at a range of personality and stress factors. Your participation is greatly appreciated.

If you wish to participate please follow the below link:

https://mqedu.qualtrics.com/SE/?SID=SV_74i9bzqzysNYiTb

Do not hesitate to contact Chris Kilby at Christopher.Kilby@mq.edu.au if you have any questions or concerns.

CONSTRUCT VALIDITY AND STABILITY OF STRESS MINDSET

A2 - Global Participant Advertisement:

“How do you stress? Stress beliefs over time”

We are seeking participants who are free of psychological and/or stress related disorders to complete four 10 minute online studies across the next 6 months (today, in one week's time, in one month's time, and in 6 month's time) in exchange for the opportunity to win 1 of 15 gift vouchers worth AUD\$100. These studies are looking at how our beliefs about stress change over time. In all four studies participants will complete a range of questionnaires. The questionnaires will look at a personality and stress factors. Your participation is greatly appreciated.

If you wish to participate please follow the below link:

https://mqedu.qualtrics.com/SE/?SID=SV_74i9bzqzysNYiTb

Do not hesitate to contact Chris Kilby at Christopher.Kilby@mq.edu.au if you have any questions or concerns.

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Appendix B

Websites that Advertised the Study

Facebook pages:

Research participation - <https://www.facebook.com/groups/436976543061997/>

Participate in MQ research - <https://www.facebook.com/groups/201470929891918/>

Psychology participants & researchers -

<https://www.facebook.com/PsychologyParticipantsResearchers?fref=ts>

Websites:

Social Psychology Network - <http://www.socialpsychology.org/expts.htm>

Sample Size (reddit community) - <http://www.reddit.com/r/SampleSize/>

Psychological Research on the Net - <http://psych.hanover.edu/research/exponnet.html>

Online Psychology Research - <http://www.onlinepsychresearch.co.uk/>

PsychStudies - <http://www.psychstudies.co.uk/index.php>

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Appendix C

Ethics Letter of Approval

Office of the Deputy Vice-Chancellor
(Research)

Research Office
Research Hub, Building C5C East
Macquarie University
NSW 2109 Australia
T: +61 (2) 9850 4459
<http://www.research.mq.edu.au/>
ABN 90 952 801 237



4 May 2015

Associate Professor Kerry Sherman
Department of Psychology
Faculty of Human Sciences
MACQUARIE UNIVERSITY NSW 2109

Dear A/Prof Sherman

Reference No: 5201500090

Title: *Can we stress healthier? The relationship between stress mindset and stress appraisal*

Thank you for submitting the above application for ethical and scientific review. Your application was considered by the Macquarie University Human Research Ethics Committee (HREC (Medical Sciences)) at its meeting on 26 February 2015 at which further information was requested to be reviewed by the HREC (Medical Sciences) Executive.

The requested information was received with correspondence on 12 April 2015.

The HREC (Medical Sciences) Executive considered your responses out of Session.

I am pleased to advise that ethical and scientific approval has been granted for this project to be conducted at:

- Macquarie University

This research meets the requirements set out in the *National Statement on Ethical Conduct in Human Research* (2007 – Updated March 2014) (the *National Statement*).

This letter constitutes ethical and scientific approval only.

Standard Conditions of Approval:

1. Continuing compliance with the requirements of the *National Statement*, which is available at the following website:

<http://www.nhmrc.gov.au/book/national-statement-ethical-conduct-human-research>

2. This approval is valid for five (5) years, subject to the submission of annual reports. Please submit your reports on the anniversary of the approval for this protocol.

3. All adverse events, including events which might affect the continued ethical and scientific acceptability of the project, must be reported to the HREC within 72 hours.

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4. Proposed changes to the protocol must be submitted to the Committee for approval before implementation.

It is the responsibility of the Chief investigator to retain a copy of all documentation related to this project and to forward a copy of this approval letter to all personnel listed on the project.

Should you have any queries regarding your project, please contact the Ethics Secretariat on 9850 4194 or by email ethics.secretariat@mq.edu.au

The HREC (Medical Sciences) Terms of Reference and Standard Operating Procedures are available from the Research Office website at:

http://www.research.mq.edu.au/for/researchers/how_to_obtain_ethics_approval/human_research_ethics

The HREC (Medical Sciences) wishes you every success in your research.

Yours sincerely



Professor Tony Eyers

Chair, Macquarie University Human Research Ethics Committee (Medical Sciences)

This HREC is constituted and operates in accordance with the National Health and Medical Research Council's (NHMRC) *National Statement on Ethical Conduct in Human Research* (2007) and the *CPMP/ICH Note for Guidance on Good Clinical Practice*.

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Details of this approval are as follows:**Approval Date:** 23 April 2015

The following documentation has been reviewed and approved by the HREC (Medical Sciences):

Documents reviewed	Version no.	Date
Macquarie University Ethics Application Form	2.3	July 2013
Correspondence from A/Prof Kerry Sherman responding to the issues raised by the HREC (Medical Sciences)		Received 12/04/2015
Appendix B: Research to be Undertaken Outside Australia		
Study Protocol	1.5	20/03/2015
MQ Participant Information and Consent Form (PICF) entitled <i>Working in Groups</i> - SONA	2	20/03/2015
MQ Participant Information and Consent Form (PICF) entitled " <i>Can We Stress Healthier?</i> " <i>The Relationship of Stress Mindset and Stress Appraisal</i> - SONA	2	20/03/2015
MQ Participant Information and Consent Form (PICF) entitled <i>Working in Groups</i> - Volunteer	2	20/03/2015
MQ Participant Information and Consent Form (PICF) entitled " <i>Can We Stress Healthier?</i> " <i>The Relationship of Stress Mindset and Stress Appraisal</i> - Volunteer	2	30/03/2015
MQ Participant Information and Consent Form (PICF) entitled " <i>Can We Stress Healthier?</i> " <i>The Relationship of Stress Mindset and Stress Appraisal</i> – Study A Part 2	2	30/03/2015
MQ Participant Information and Consent Form (PICF) entitled " <i>Can We Stress Healthier?</i> " <i>The Relationship of Stress Mindset and Stress Appraisal</i> – Internet (AUS)	2	20/03/2015
MQ Participant Information and Consent Form (PICF) entitled " <i>Can We Stress Healthier?</i> " <i>The Relationship of Stress Mindset and Stress Appraisal</i> – Internet (UK)	2	20/03/2015
MQ Participant Information and Consent Form (PICF) entitled " <i>Can We Stress Healthier?</i> " <i>The Relationship of Stress Mindset and Stress Appraisal</i> – Internet (USA)	2	20/

CONSTRUCT VALIDITY AND STABILITY OF STRESS MINDSET

Participant Questionnaire	1.5	
Advertisements including Study A – SONA, Study A – Personal network and Online AUS, USA & UK participant pools	1.5	20/03/2015

CONSTRUCT VALIDITY AND STABILITY OF STRESS MINDSET

Appendix D

Participant Information and Consent forms

D1 - First Year Psychology Participant Information and Consent Form

DEPARTMENT OF PSYCHOLOGY

Faculty of Human Sciences

MACQUARIE UNIVERSITY NSW 2109

Phone: 0432 720 967

Email: Christopher.kilby@mq.edu.au

Supervisor's Name: Associate Professor Kerry Sherman

**MACQUARIE**
University**Participant Information and Consent Form**

Name of Project:

“How do you stress? Stress beliefs over time”

You are invited to participate in a study about how we perceive stress. The purpose of the study is to investigate how our stress mindset (beliefs about the nature of stress) manifests over time.

The study is being conducted to meet the requirements of the Masters of Research (Psychology) program under the supervision of A/Prof. Kerry Sherman (Department of Psychology, ph: 9850 6874, email: Kerry.Sherman@mq.edu.au).

This is a three part study; each part will last approximately 15 minutes. You are under no obligation to participate. In order to sign up for the study, you must agree to the terms of participation noted at the end of this information and consent form. You are free to end your participation at any stage. As a participant, you are obligated to answer all questions

CONSTRUCT VALIDITY AND STABILITY OF STRESS MINDSET

accurately and honestly. Answering fictitiously or haphazardly jeopardises the quality of the research.

If you decide to participate, you will be asked to complete three 15 minute surveys. The first will be today, the second in one week's time, and the third in a month's time. You will receive 0.5 units of credit for each completed survey that will be awarded at the completion of your third survey (i.e., you will receive 1.5 credits for completing all three surveys).

If this study makes you feel overly stressed, or you are finding it hard to calm down please contact Lifeline on 13 11 14. You can also contact the Macquarie University Counselling services via phone: 9850 7497 or email counselling@mq.edu.au. If this study triggers memories of distressing events then any of the following organisations can help you work through these memories and feelings. BeyondBlue (ph: 1300 22 4636) are a 24 hour organisation who can assist with any feelings of depression or anxiety that might have arisen from this study. HeadSpace (www.headspace.org.au) have a number of centres which you are more than welcome to visit to discuss any feelings of stress, depression, anxiety, or worry that this study may have brought up. Finally, MensLine (ph: 1300 78 99 78) is a 24 hour service offered to men who feel alone, depressed, anxious, or otherwise feeling not ok.

Any information or personal details gathered in the course of the study are confidential, except as required by Australian law. This personal information will be used to track study progression. No individual will be identified in any publication of the results. Only the chief investigator and co-investigator will have access to the collected information. A summary of the results of the data will be made available to you on request after the completion of the study. Please email the researcher at Christopher.kilby@mq.edu.au addressing your interest in the results.

As a research participant you are responsible for:

CONSTRUCT VALIDITY AND STABILITY OF STRESS MINDSET

- Completely reading information and consent forms
- Carefully weighing the risks and benefits of participation
- Knowing when, where, and for how long participation is required
- Talking to the researcher when concerns arise
- Fulfilling the responsibilities as described in the information and consent forms

The ethical aspects of this study have been approved by the Macquarie University Human Research Ethics Committee. If you have any complaints or reservations about any ethical aspect of your participation in this research, you may contact the Committee through the Director, Research Ethics and Integrity (telephone (02) 9850 7854; email ethics@mq.edu.au). Any complaint you make will be treated in confidence and investigated, and you will be informed of the outcome.

By participating in this study you are agreeing to 1) have read and understood the information above, 2) any questions you have asked have been answered to your satisfaction, 3) are over the age of 18, 4) speak English as your first language, and 5) are free of psychological and stress related disorders. You are agreeing to participate in this research, knowing that you can withdraw from further participation in the research at any time without consequence. You recognise that you will be emailed a copy of this form to keep.

CONSTRUCT VALIDITY AND STABILITY OF STRESS MINDSET

D2 - Australian Global Sample Information and Consent Form

DEPARTMENT OF PSYCHOLOGY

Faculty of Human Sciences

MACQUARIE UNIVERSITY NSW 2109

Phone: 0432 720 967

Email: Christopher.kilby@mq.edu.au

Supervisor's Name: Associate Professor Kerry Sherman



Participant Information and Consent Form

Name of Project:

“How do you stress? Stress beliefs over time”

You are invited to participate in a study about how we perceive stress in exchange for the opportunity to win 1 of 15 gift vouchers worth AUD\$100. The purpose of the study is to investigate how our stress mindset (beliefs about the nature of stress) manifests over time.

The study is being conducted to meet the requirements of the Masters of Research (Psychology) program under the supervision of A/Prof. Kerry Sherman (Department of Psychology, ph: 9850 6874, email: Kerry.Sherman@mq.edu.au).

This is four part study; each part will last approximately 5 minutes. You are under no obligation to participate and will not be given access to the surveys without agreeing to these terms and conditions. In order to sign up for the study, you must agree to the terms of participation noted at the end of this information and consent form. You are free to end your participation at any stage. As a participant, you are obligated to answer all questions accurately and honestly. Answering fictitiously or haphazardly jeopardises the quality of the research.

CONSTRUCT VALIDITY AND STABILITY OF STRESS MINDSET

If you decide to participate, you will be asked to complete four 5 minute surveys. The first will be today, the second in one week's time, the third in a month's time, and the fourth in six months' time. You will be entered into the draw to win 1 of the 15 gift vouchers upon completing the six months survey.

If this study has made you feel overly stressed, or you are finding it hard to calm down please contact Lifeline on 13 11 14. You can also contact the Macquarie University Counselling services via phone: 9850 7497 or email counselling@mq.edu.au. If this study triggers memories of distressing events then any of the following organisations can help you work through these memories and feelings. BeyondBlue (ph: 1300 22 4636) are a 24 hour organisation who can assist with any feelings of depression or anxiety that might have arisen from this study. HeadSpace (www.headspace.org.au) have a number of centres which you are more than welcome to visit to discuss any feelings of stress, depression, anxiety, or worry that this study may have brought up. Finally, MensLine (ph: 1300 78 99 78) is a 24 hour service offered to men who feel alone, depressed, anxious, or otherwise feeling not ok.

Any information or personal details gathered in the course of the study are confidential, except as required by Australian law. This personal information will be used to track study progression. No individual will be identified in any publication of the results. Only the chief investigator and co-investigator will have access to the collected information. A summary of the results of the data will be made available to you on request after the completion of the study. Please email the researcher at Christopher.kilby@mq.edu.au addressing your interest in the results.

As a research participant you are responsible for:

- Completely reading information and consent forms
- Carefully weighing the risks and benefits of participation

CONSTRUCT VALIDITY AND STABILITY OF STRESS MINDSET

- Knowing when, where, and for how long participation is required
- Talking to the researcher when concerns arise
- Fulfilling the responsibilities as described in the information and consent forms

The ethical aspects of this study have been approved by the Macquarie University Human Research Ethics Committee. If you have any complaints or reservations about any ethical aspect of your participation in this research, you may contact the Committee through the Director, Research Ethics and Integrity (telephone (02) 9850 7854; email ethics@mq.edu.au). Any complaint you make will be treated in confidence and investigated, and you will be informed of the outcome.

By participating in this study you are agreeing to 1) have read and understood the information above, 2) any questions you have asked have been answered to your satisfaction, 3) are over the age of 18, and 4) speak English as your first language. You are agreeing to participate in this research, knowing that you can withdraw from further participation in the research at any time without consequence. You recognise that you will be emailed a copy of this form to keep.

CONSTRUCT VALIDITY AND STABILITY OF STRESS MINDSET

D3 - UK Global Sample Information and Consent Form

DEPARTMENT OF PSYCHOLOGY

Faculty of Human Sciences



MACQUARIE UNIVERSITY NSW 2109

Phone: 0432 720 967

Email: Christopher.kilby@mq.edu.au

Supervisor's Name: Associate Professor Kerry Sherman

Participant Information and Consent Form

Name of Project:

“How do you stress? Stress beliefs over time”

You are invited to participate in a study about how we perceive stress in exchange for the opportunity to win 1 of 15 gift vouchers worth AUD\$100. The purpose of the study is to investigate how our stress mindset (beliefs about the nature of stress) manifests over time.

The study is being conducted to meet the requirements of the Masters of Research (Psychology) program under the supervision of A/Prof. Kerry Sherman (Department of Psychology, ph: 9850 6874, email: Kerry.Sherman@mq.edu.au).

This is four part study; each part will last approximately 5 minutes. You are under no obligation to participate and will not be given access to the surveys without agreeing to these terms and conditions. In order to sign up for the study, you must agree to the terms of participation noted at the end of this information and consent form. You are free to end your participation at any stage. As a participant, you are obligated to answer all questions accurately and honestly. Answering fictitiously or haphazardly jeopardises the quality of the research.

If you decide to participate, you will be asked to complete four 5 minute surveys. The first will be today, the second in one week's time, the third in a month's time, and the fourth

CONSTRUCT VALIDITY AND STABILITY OF STRESS MINDSET

in six months' time. You will be entered into the draw to win 1 of the 15 gift vouchers upon completing the six months survey. The gift voucher will be in GB pounds to the value of \$100 Australian dollars at the time of the draw.

If this study has made you feel overly stressed, or you are finding it hard to calm down please contact Samaritans on 08457 90 90 90, Samaritans operate 24 hours a day, 7 days a week. You can also contact the Sane charity by phone: 0845 767 8000 between 6PM and 11PM daily, or email at_sanemail@org.uk. If you are feeling overly anxious or panicky you can contact No Panic on 0844 967 4848 between 10am and 10pm 7 days a week. All of these services are offered free to anyone under the NHS.

Any information or personal details gathered in the course of the study are confidential, except as required by Australian law. This personal information will be used to track study progression. No individual will be identified in any publication of the results. Only the chief investigator and co-investigator will have access to the collected information. A summary of the results of the data will be made available to you on request after the completion of the study. Please email the researcher at Christopher.kilby@mq.edu.au addressing your interest in the results.

As a research participant you are responsible for:

- Completely reading information and consent forms
- Carefully weighing the risks and benefits of participation
- Knowing when, where, and for how long participation is required
- Talking to the researcher when concerns arise
- Fulfilling the responsibilities as described in the information and consent forms

The ethical aspects of this study have been approved by the Macquarie University Human Research Ethics Committee. If you have any complaints or reservations about any ethical aspect of your participation in this research, you may contact the Committee

CONSTRUCT VALIDITY AND STABILITY OF STRESS MINDSET

through the Director, Research Ethics and Integrity (telephone (02) 9850 7854; email ethics@mq.edu.au). Any complaint you make will be treated in confidence and investigated, and you will be informed of the outcome.

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CONSTRUCT VALIDITY AND STABILITY OF STRESS MINDSET

D4 - USA Global Sample Information and Consent Form

DEPARTMENT OF PSYCHOLOGY

Faculty of Human Sciences

MACQUARIE UNIVERSITY NSW 2109

Phone: 0432 720 967

Email: Christopher.kilby@mq.edu.au

Supervisor's Name: Associate Professor Kerry Sherman

**MACQUARIE**
University**Participant Information and Consent Form**

Name of Project:

“How do you stress? Stress beliefs over time”

You are invited to participate in a study about how we perceive stress in exchange for the opportunity to win 1 of 15 gift vouchers worth AUD\$100. The purpose of the study is to investigate how our stress mindset (beliefs about the nature of stress) manifests over time.

The study is being conducted to meet the requirements of the Masters of Research (Psychology) program under the supervision of A/Prof. Kerry Sherman (Department of Psychology, ph: 9850 6874, email: Kerry.Sherman@mq.edu.au).

This is four part study; each part will last approximately 10 minutes. You are under no obligation to participate and will not be given access to the surveys without agreeing to these terms and conditions. In order to sign up for the study, you must agree to the terms of participation noted at the end of this information and consent form. You are free to end your participation at any stage. As a participant, you are obligated to answer all questions accurately and honestly. Answering fictitiously or haphazardly jeopardises the quality of the research.

If you decide to participate, you will be asked to complete four 10 minute surveys. The first will be today, the second in one week's time, the third in a month's time, and the fourth

CONSTRUCT VALIDITY AND STABILITY OF STRESS MINDSET

in six months' time. You will be entered into the draw to win 1 of the 15 gift vouchers upon completing the six months survey. The gift voucher will be in US currency to the value of \$100 Australian dollars at the time of the draw.

If this study has made you feel overly stressed, or you are finding it hard to calm down please contact the Crisis Support hotline on 1-800 273-8255. Alternatively, you can contact the National Alliance on Mental Illness on 950 6264 for more support. Both of these services are offered free of charge.

Any information or personal details gathered in the course of the study are confidential, except as required by Australian law. This personal information will be used to track study progression. No individual will be identified in any publication of the results. Only the chief investigator and co-investigator will have access to the collected information. A summary of the results of the data will be made available to you on request after the completion of the study. Please email the researcher at Christopher.kilby@mq.edu.au addressing your interest in the results.

As a research participant you are responsible for:

- Completely reading information and consent forms
- Carefully weighing the risks and benefits of participation
- Knowing when, where, and for how long participation is required
- Talking to the researcher when concerns arise
- Fulfilling the responsibilities as described in the information and consent forms

The ethical aspects of this study have been approved by the Macquarie University Human Research Ethics Committee. If you have any complaints or reservations about any ethical aspect of your participation in this research, you may contact the Committee through the Director, Research Ethics and Integrity (telephone (02) 9850 7854;

CONSTRUCT VALIDITY AND STABILITY OF STRESS MINDSET

email ethics@mq.edu.au). Any complaint you make will be treated in confidence and investigated, and you will be informed of the outcome.

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CONSTRUCT VALIDITY AND STABILITY OF STRESS MINDSET

Appendix E

Questionnaire

Demographics, and inclusion criteria

Please type in your first name: _____

Please type in your last name: _____

Please type in your email address:

Please type in your age: _____

Please type in your student ID(*students only*): _____

Please select your gender: Male ☐

Female ☐

Which country do you live in: _____

Please indicate the highest level of education you have achieved

Some or no schooling ☐

Completed high school ☐

Undergraduate degree ☐

Post-graduate degree ☐

Doctorate degree or higher ☐

Are you currently suffering from a psychological disorder?

Yes ☐

No ☐

Are you currently suffering from a stress related disorder?

Yes ☐

CONSTRUCT VALIDITY AND STABILITY OF STRESS MINDSET

No ☐

Participants who endorse an age under 18 years, having a psychological disorder, having a stress related disorder, or report living in a country other than Australia, the USA, or the UK will see the following before the survey ends. Everyone else will proceed to the pre-manipulation battery of questionnaires.

Exclusion –

“Unfortunately you do not meet the requirements to participate in this study. Thank you for your willingness to donate your time, and we do apologise for any inconvenience.”

Covariate battery of questionnaires

The following questionnaires will be presented in a randomized order.

STAI - Trait subscale (Spielberger et al., 1970)

Directions: A number of statements that people use to describe themselves are given below.

Read each statement and then circle the number corresponding to the statement that indicates how you GENERALLY FEEL. There are no right or wrong answers. Do not spend too much time on any statement. Please give the answer that seems to describe how you generally feel.

	Not at All	Very Little	Moderately	Very Much
I feel pleasant.	1	2	3	4
I feel nervous and restless.	1	2	3	4
I feel satisfied with myself.	1	2	3	4

CONSTRUCT VALIDITY AND STABILITY OF STRESS MINDSET

I wish I could be as happy as others seem to be.	1	2	3	4
I feel like a failure.	1	2	3	4
I feel rested.	1	2	3	4
I am "calm, cool, and collected ".	1	2	3	4
I feel that difficulties are piling up so that I cannot overcome them.	1	2	3	4
I worry too much over something that really doesn't matter.	1	2	3	4
I am happy.	1	2	3	4
I have disturbing thoughts.	1	2	3	4
I lack self-confidence.	1	2	3	4
I feel secure.	1	2	3	4
I make decisions easily.	1	2	3	4
I feel inadequate.	1	2	3	4
I am content.	1	2	3	4
Some unimportant thought runs through my mind and they bother me.	1	2	3	4
I take disappointments so keenly that I can't put them out of my mind.	1	2	3	4
I am a steady person.	1	2	3	4
I get in a state of tension or turmoil as I think over my recent concerns and interests.	1	2	3	4

CONSTRUCT VALIDITY AND STABILITY OF STRESS MINDSET

Perceived Stress Scale (Cohen et al., 1983)

The questions in this scale ask you about your feelings and thoughts during the last month. In each case, you will be asked to indicate *how often* you felt or thought a certain way. Although some of the questions are similar, there are differences between them and you should treat each one as a separate question. The best approach is to answer each question fairly quickly. That is, don't try to count up the number of times you felt a particular way, but rather indicate the alternative that seems like a reasonable estimate.

	0 Never	1 Almost never	2 Sometimes	3 Fairly often	4 Very often
In the last month, how often have you been upset because of something that happened unexpectedly?					
In the last month, how often have you felt that you were unable to control the important things in your life?					
In the last month, how often have you dealt successfully with irritating life hassles?					
In the last month, how often have you felt that you were effectively coping with important changes that were occurring in your life?					

CONSTRUCT VALIDITY AND STABILITY OF STRESS MINDSET

In the last month, how often have you felt confident about your ability to handle your personal problems?					
In the last month, how often have you felt that things were going your way?					
In the last month, how often have you found that you could not cope with all the things that you had to do?					
In the last month, how often have you been able to control irritations in your life?					
In the last month, how often have you felt that you were on top of things?					
In the last month, how often have you been angered because of things that happened that were outside of your control?					
In the last month, how often have you found yourself thinking about things that you have to accomplish?					
In the last month, how often have you been able to control the way you spend your time?					

CONSTRUCT VALIDITY AND STABILITY OF STRESS MINDSET

In the last month, how often have you felt difficulties were piling up so high that you could not overcome them?					
--	--	--	--	--	--

Stress Mindset Measure – General (Crum et al., 2013)

Please rate the extent to which you agree or disagree with the following statements.

	0 Strongly disagree	1 Disagree	2 Neither agree nor disagree	3 Agree	4 Strongly agree
1. The effects of stress are negative and should be avoided					
2. Experiencing stress facilitates my learning and growth					
3. Experiencing stress depletes my health and vitality					
4. Experiencing stress enhances my performance and productivity					

CONSTRUCT VALIDITY AND STABILITY OF STRESS MINDSET

5. Experiencing stress inhibits my learning and growth					
6. Experiencing stress improves my health and vitality					
7. Experiencing stress debilitates my performance and productivity					
8. The effects of stress are positive and should be utilised					

Self Control subscale of the Trait Emotional Intelligence Questionnaire – Short Form

(Petrides & Furnham, 2006)

Instructions: Please answer each statement below by putting a circle around the number that best reflects your degree of agreement or disagreement with that statement. Do not think too long about the exact meaning of the statements. Work quickly and try to answer as accurately as possible. There are no right or wrong answers. There are seven possible responses to each statement ranging from ‘Completely Disagree’ (number 1) to ‘Completely Agree’ (number 7).

1 2 3 4 5 6 7

Completely

Completely

Disagree

Agree

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	1	2	3	4	5	6	7
1 I usually find it difficult to regulate my emotions							
2 I tend to change my mind frequently							
3 On the whole, I'm able to deal with stress							
4 I'm usually able to find ways to control my emotions when I want to							
5 I tend to get involved in things I later wish I could get out of							
6 Others admire me for being relaxed							

Ten-Item Personality Inventory

(Gosling et al., 2003)

Here are a number of personality traits that may or may not apply to you. Please write a number next to each statement to indicate the extent to which you agree or disagree with that statement. You should rate the extent to which the pair of traits applies to you, even if one characteristic applies more strongly than the other.

1 Disagree strongly

2 Disagree moderately

3 Disagree a little

4 Neither agree nor disagree

5 Agree a little

6 Agree moderately

7 Agree strongly

	1	2	3	4	5	6	7
Extraverted, enthusiastic							
Critical, quarrelsome							

CONSTRUCT VALIDITY AND STABILITY OF STRESS MINDSET

Dependable, self-disciplined								
Anxious, easily upset								
Open to new experiences, complex								
Reserved, quiet								
Sympathetic, warm								
Disorganized, careless								
Calm, emotionally stable								
Conventional, uncreative								

End of questionnnaire.

CONSTRUCT VALIDITY AND STABILITY OF STRESS MINDSET

Appendix F

Table of skewness and kurtosis statistics

	<i>Skew(SE)</i>	<i>Stat</i>	<i>Kurt(SE)</i>	<i>Stat</i>
Age	2.36(.22)	10.73	6.22(.43)	14.47
Trait anxiety	0.09(.22)	0.41	-.70(.43)	-1.62
Perceived stress	0.20(.22)	0.92	-.20(.43)	-0.46
Extraversion	0.09(.22)	0.41	-.85(.43)	-1.98
Agreeableness	0.05(.22)	0.23	-.74(.43)	-1.72
Conscientiousness	-0.41(.22)	-1.86	-.37(.43)	-0.86
Neuroticism	0.06(.22)	0.28	-.86(.43)	-2.00
Openness	-0.07(.22)	-0.32	-.04(.43)	-0.09
Emotional management	-0.03(.22)	-0.14	-.70(.43)	-1.62
Stress mindset baseline	0.04(.22)	0.18	.26(.43)	0.60
Stress mindset one week	-0.25(.22)	-1.15	.19(.43)	0.44
Stress mindset one month	-0.11(.22)	-0.51	.16(.43)	0.37

Note. Kurt = kurtosis.

CONSTRUCT VALIDITY AND STABILITY OF STRESS MINDSET

Appendix G

ANOVA results for all variables by country (for the global participants only)

	Australia (<i>n</i> = 38)		US (<i>n</i> = 18)		UK (<i>n</i> = 7)			
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>F</i>	<i>p</i>
Age (<i>Mdn, IQR</i>)	23	21-28	24	20-30	29	22-48	2.36*	.308
Female (<i>n, %</i>)	31	81.58	14	77.78	6	85.71	0.23†	.891
Education							4.24†	.835
Some high school	2	5.26	1	5.56	0	0.00		
Completed high school	15	39.47	8	44.44	1	14.29		
Undergraduate	15	39.47	6	33.33	5	71.43		
Postgraduate	5	13.16	3	16.67	1	14.29		
Doctorate	1	2.63	0	0.00	0	0.00		
Trait anxiety	45.47	11.48	44.62	9.17	40.71	14.14	0.54	.588
Perceived stress	23.66	8.44	23.27	8.94	17.00	10.52	1.72	.187
Extraversion	8.16	3.12	7.63	3.54	6.71	3.15	0.64	.532
Agreeableness	9.92	2.19	10.11	2.02	11.71	1.80	2.16	.125
Conscientiousness	10.23	2.66	10.20	2.03	10.00	3.00	0.04	.961

Note. * Due to age being positively skewed, median and interquartile ranges are reported, and a Kruskal-Wallis *H* test was conducted in lieu of the one-way ANOVA. † χ^2 statistic reported in place of *F* statistic.

CONSTRUCT VALIDITY AND STABILITY OF STRESS MINDSET

Table G continued.

	Australia (<i>n</i> = 38)		US (<i>n</i> = 18)		UK (<i>n</i> = 7)			
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>F</i>	<i>p</i>
Neuroticism	8.53	3.19	8.52	3.03	9.57	4.04	0.32	.725
Openness	9.53	2.47	9.79	3.59	10.71	2.43	0.53	.594
Emotional management	4.38	1.06	4.55	1.12	5.07	0.88	1.27	.290
Stress mindset	1.87	0.74	1.83	0.54	1.86	0.77	0.02	.981
Stress mindset one week	1.93	0.76	1.87	0.58	1.89	1.01	0.05	.956
Stress mindset one month	1.93	0.82	1.57	0.71	1.89	0.80	1.33	.271

CONSTRUCT VALIDITY AND STABILITY OF STRESS MINDSET

Appendix H

Results of the multiple linear regressions for construct validity, including covariate results

	<i>b</i> (<i>SE</i>)	<i>B</i>	<i>p</i>	95% CI		<i>partial</i> η^2
				<i>LL</i>	<i>UL</i>	
Perceived Stress	-0.03(0.01)	-0.43	<.0005	-0.04	-0.02	0.18
Age	-0.02(0.10)	-0.24	.011	-0.03	0.00	0.06
Education	0.44(0.74)	0.05	.336	-1.03	1.90	0.00
Trait Anxiety	-0.04(0.01)	-0.44	<.0005	-0.05	-0.02	0.18
Age	-0.02(0.01)	-0.20	.025	-0.03	-0.02	0.04
Education	0.82(0.75)	0.02	.294	-0.66	2.30	0.04
Emotional Management	0.29(0.06)	0.40	<.0005	0.17	0.41	0.16
Age	-0.01(0.01)	-0.18	.064	-0.03	0.00	0.03
Education	0.80(0.76)	0.00	.388	-0.71	2.30	0.01
Sample source	-0.04(0.14)	0.01	.758	-0.33	0.24	0.00
Openness	0.08(0.03)	0.29	.003	0.03	0.13	0.08
Age	-0.01(0.01)	-0.15	.150	-0.02	0.00	0.02
Education	0.28(0.80)	0.10	.639	-1.30	1.86	0.00
Conscientiousness	-0.01(0.03)	-0.04	.728	-0.06	0.05	0.00
Age	-0.01(0.01)	-0.09	.828	-0.02	0.01	0.01
Education	0.40(0.83)	0.06	.703	-1.25	2.05	0.00
Extraversion	0.03(0.02)	0.12	.182	-0.01	0.07	0.02
Age	-0.01(0.02)	-0.10	.298	-0.02	0.01	0.01
Education	0.57(0.01)	0.04	.578	-1.06	2.21	0.00
Agreeableness	0.04(0.03)	0.11	.273	-0.03	0.10	0.01
Age	-0.01(0.01)	-0.12	.259	-0.02	0.01	0.01
Education	0.59(0.83)	0.03	.624	-1.05	2.22	0.00
Neuroticism	0.10(0.02)	0.41	<.0005	0.06	0.14	0.16
Age	-0.01(0.01)	-0.20	.042	-0.03	0.00	0.04
Education	0.79(0.76)	0.03	.511	-0.71	2.29	0.01

Note. DV: Stress Mindset scores at baseline. All variables are baseline scores. Each line represents a separate regression controlling for age and education. * controlling for age, education, and sample source.

CONSTRUCT VALIDITY AND STABILITY OF STRESS MINDSET

Appendix I

Results of the multiple linear regressions for construct stability, including covariate results

				95% CI		
	<i>b</i> (<i>SE</i>)	<i>B</i>	<i>p</i>	<i>LL</i>	<i>UL</i>	<i>partial</i> η^2
Stress mindset one week						
SM baseline	0.84(0.05)	0.84	<.0005	0.74	0.94	0.70
Age	0.00(0.00)	0.01	.776	-0.01	0.01	0.00
Education	-0.38(0.47)	0.01	.779	-1.32	0.55	0.01
Stress mindset one month						
SM baseline	0.83(0.07)	0.77	<.0005	0.70	0.96	0.59
Age	0.00(0.01)	-0.04	.498	-0.01	0.01	0.01
Education	0.60(0.56)	-0.06	.618	-0.51	1.71	0.02

Note. SM baseline = stress mindset at baseline.