Differential Effects of Challenge and Hindrance Stressors on Decision Making Performance

by

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Abstract

The current study proposed differential relationships of challenge and hindrance stressors on decision-making performance based on the 2-dimensional model of stressors, which was expected to be mediated by perceived control, self-efficacy, and effort. Challenge and hindrance stressor conditions were experimentally manipulated by implementing a pay-off matrix that made success on the task seem more difficult in the hindrance stressor condition than the challenge stressor condition. In a sample of 95 learners, levels of felt stress, perceived control, self-efficacy, and negative affect were significantly different between challenge and hindrance stressor conditions in the expected directions. There was also evidence that self-efficacy may have partially mediated the stressor–performance relationship. Decision-making performance was lower in the presence of time pressure for both stressor conditions. Unexpectedly, there were no significant differences in performance across the stressor conditions. Explanations for null results, limitations, and future research directions are discussed.

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Introduction

It is important to investigate the relationship between stress and decision making because the two occur in tandem for many jobs. As extreme examples, decision making under stress in fields such as medicine (Kirschenbaum & Aruda, 1994), and the military (Schwartz & Howell, 1985) can mean the difference between life and death. However, the mechanics of how people make decisions under stress remain unclear (Hastie, 2001; Mellers, Schwartz & Cooke, 1998). Understanding the process of how job stressors lead to changes in performance is a crucial step in understanding how to anticipate and cope with job stress.

A job stressor is a factor, condition, or situation in the work environment that interacts with the worker, leading to a change in psychological, physiological, or behavioral response so that the worker deviates from normal functioning (Beehr & Newman, 1978). Job stressors have typically been described as events that are perceived and interpreted as somehow threatening to physical or psychological well-being, or situations that lead to a negative response such as anger, frustration, anxiety, or tension (Spector, 2002; Spector, 1998). Most workplaces are experiencing an increase in job stressors due to demands such as broadened job scopes and increased workloads (Jex, 1998), and research on job stress has increased to address the issue.

Strains are usually classified into one of three types: psychological, behavioral, or physical (Jex & Beehr, 1991). Psychological strains include any sort of mental distress such as burnout and job dissatisfaction (Schmidt, 2007), and increased anxiety levels (e.g., Spector, Dwyer & Jex, 1998; Spector & Jex, 1998; LePine, LePine, & Jackson, 2004; LePine, Podsakoff, & LePine, 2005), which have been positively related to job stressors (Boswell, Olson-Buchanan,

& LePine, 2004). Psychological disorders such as depression have also been diagnosed in people exposed to occupational stressors (Spector & Jex, 1998). Behavioral strains are instances of behavior elicited in response to a job stressor (Spector, 1998). Workplace problems such as absenteeism or destructive work behavior have been linked to behavioral strains resulting from job stressor exposure (Spector & Jex, 1998; Fox & Spector, 1999). Workplace stressors have also been associated with drug and alcohol use on the job, and counterproductive work behaviors (CWBs). CWBs include intentionally doing inferior work, stealing from employers, and intentionally damaging company property. Behavioral strains have substantially contributed to lost company revenue and time through waning worker performance, and employee backlash in the form of CWBs (Ryland & Greenfeld, 1991).

Physical strains have been defined as a nonspecific bodily response to any demand (Selye, 1971). Correlational data have linked various physical strains, including cardiovascular disease, to job stressor exposure (e.g., Vagg & Spielberger, 1998; Ganster, Fusilier, & Mayes, 1986; Theorell & Karasek, 1996). For example, a naval study showed that sailors in jobs that were judged a priori to be more stressful tended to report in to work as sick more often and required more medical treatment than those in less stressful jobs (Rahe, Gunderson, Pugh, Rubin, & Arthur, 1972). A study by Cobb and Kasl (1972) looked at employees of a manufacturing plant that was in the process of closing and found that as workers' unemployment approached, their uric acid and blood pressure levels increased. When the manufacturing plant finally did close, workers' cholesterol levels increased, and did not return to normal until the workers found new employment elsewhere. Clearly, stressors can be deleterious to workers' physical well-being. Physical strains from job stressors also raise costs for organizations due to increases in health care and health insurance for ailing employees (Ryland & Greenfeld, 1991).

Though the relationship between stressors and strains is well-established, the processes that lead from stressors in the job environment to the perception of stress and associated psychological, physical, and behavioral strains and ultimately to job performance, are not fully understood. Examining the mechanisms underlying the stressor–performance relationship may lead to greater understanding of how stressors hinder or assist performance. Major goals of stress research are to decrease the harmful effects of workplace stressors, decrease worker strains, and improve worker performance. However, we first need to understand the mechanisms which explain the relationship between stressors and performance. A popular model to explain job stress is the 2-dimensional model of challenge and hindrance stressors. Research has demonstrated that challenge stressors can lead to improved performance and hindrance stressors can hamper performance (Pearsall, Ellis, & Stein, 2009). However, it is unclear exactly why the two types of stressors are differentially related to performance. Thus, the objectives of the present study were to: (a) compare the differential effects of challenge stressor and hindrance stressor conditions on levels of perceived control, self-efficacy, and effort; (b) test perceived control, self-efficacy, and effort as potential mediators of the relationship between stressors and performance; (c) examine causality in the stressor–performance relationship by experimentally manipulating stressor conditions; (d) measure the effect of time pressure on performance in the presence of challenge or hindrance stressors.

Models of stress

In 1950, American death rates from cardiovascular disease were twice as high for real estate agents and brokers than for mail carriers; suicide rates for policemen, sheriffs and marshals were double what they were for lawyers and judges (Margolis, Kroes, & Quinn, 1974). Statistics like these could not be explained by measures of quantifiable work-related hazards

such as levels of industrial chemicals, carbon monoxide, and lead. Researchers realized that measures of workplace hazards such as chemicals were not adequately explaining the discrepancies in health-related problems among professions. Soon job stress became the focus of research looking for an explanation for differential work outcomes across industries. Promising research included an examination of airport employees that found that air traffic controllers with high levels of reported job stress had four times the rate of hypertension and double the rate of peptic ulcers and diabetes compared to second class airmen who reported lower job-related stress levels (Cobb & Rose, 1973). Researchers began to ask why self-reported stress coincided with reports of health complaints, and simultaneously designed models in an attempt to explain the relationship between job stress and employee health.

Some of the earliest stress models focused on the observed and self-reported negative consequences of job stress and the potential mediating variables. In a review, Beehr and Newman (1978) noted that psychology had yet to examine how stressors impacted the health of employees, and that most of the literature on stressors and health was in other disciplines. The effects of stressors on the health and welfare of employees were suggested to affect performance, indicating that the relationship between stressors and performance needed further study in the social and behavioral sciences. Beehr and Newman (1978) outlined seven facets of job stressors: environmental, personal, process, human consequences, organizational consequences, adaptive responses, and time. The facets were based on previous research and variables theorized to be involved in the stress process. Each facet included multiple components thought to influence how a stressor was perceived and how a stressor interacted with and affected the worker. For example, the environmental facet included role ambiguity and workload; the personal facet included motives, goals and introversion or extroversion of the worker; the process facet

included perceptions of past, present, and predicted future situations; the human consequences facet included psychological (e.g., depression), physical (e.g., cardiovascular disease) and behavioral (e.g., aggression) consequences; the organizational consequences facet included changes in quantity and quality of job performance and increases or decreases in withdrawal behaviors (e.g., absenteeism); the adaptive response facet included meditation and relaxation techniques used to cope with job stressors; and the time facet included time as a variable in the development and response to stress. The personal facet and the environmental facet were suggested to interact through the process facet to produce human and organizational consequences. The adaptive responses were activated to cope with the consequences, and the adaptive responses in turn acted as feedback and affected the personal and environmental facets, and the time facet affected the process at all levels.

The intuitively appealing inverted-U theory (Yerkes & Dodson, 1908) was another model that has been applied to stress research. The idea behind the inverted-U theory was that increased stress (or arousal) is good up to a point, but begins to have a negative effect on performance as stress continues to increase (Muse, Harris, & Field, 2003). Thus, understressed conditions resulted in poor performance because individuals were not stimulated, and thus had low arousal and low activation. Likewise, overstressed conditions also resulted in poor performance because stress levels beyond what is required for maximum performance consumed an individual's time, energy and attention, thus inhibiting job performance (Jamal, 1985; Muse et al., 2003). Some level of stress may be necessary to motivate optimal job performance, but the inverted-U theory of stress did not include an explanation of the underlying mechanisms in the stressor–performance relationship. As a result, the inverted-U theory has mostly been dismissed as an

explanation for the relationship between stressors and performance and has not received much recent research attention (Neiss, 1988; Westman & Eden, 1991).

Two of the most commonly researched models of job stress are the Job Demand-Control (JDC) model first proposed by Karasek (1979), and an elaborated version of the JDC model known as the Job Demand-Control-Support (JDCS) model (Johnson & Hall, 1988). In both models, job demands represent the workload of a job and have been operationally defined in previous studies as time pressure, role conflict (Karasek, 1985), role ambiguity (Spector & Jex, 1998), and interpersonal conflict (Keenan & Newton, 1985). Job demands are job stressors which have been shown to affect work performance through strains. The JDC model (Karasek, 1979) posits that job control moderates the relationship between job demands and strains (Van der Doef & Maes, 1999). Job control is defined as having the option to decide between two or more choices on the job (Ganster & Fusilier, 1989). Thus, a job with high control and high demand is a "low strain" job because control within the job buffers the usual outcome of high strain from a high demand job. The employee in this situation should perceive the situation as less stressful than a situation with high demand, but little job control. The JDCS model (Johnson & Hall, 1988) posits that in addition to control, support also moderates the relationship between job demands and strains. Several types of support including organizational support, supervisor support, and co-worker support have all been proposed to buffer the effect of job demands (Vagg & Spielberger, 1998).

Spector's (1998) influential model of the job stress process distinguished between environmental stressors and perceived stressors. Environmental stressors are conditions in the job environment, whereas perceived stressors are the appraisal and interpretation of the environmental stressor. Perceived control and self-efficacy moderate the relationship between

environmental stressors and perceived stressors. The reaction to a perceived stressor is an emotional response that mediates, at least in part, the effects of job stressors on strains. The perception of the stressor, the perceived control over the stressor, the self-efficacy of the worker, and the emotional response to the perceived stressor all affect the relationship between job stressors and strains. For example, when perceived control and self-efficacy are high, the relationship between environmental and perceived stressors is weak. The job incumbent does not perceive the condition or situation as a stressor, so an emotional response is not elicited and the resulting strains are minimal. Conversely, when perceived control and self-efficacy are low, the relationship between environmental and perceived stressors is strong. The individual is likely to interpret the condition or situation as being a job stressor, and will have an emotional response that leads to strains. Emotional responses such as anger and anxiety may direct behavior in a productive or counterproductive way. For example, when control and self-efficacy are high, a problem-focused response may be used, leading to an attempt to overcome the situation which can successfully manage job strains. With low perceived control and self-efficacy, an emotion-focused response is more likely to be used because the individual may believe that nothing constructive can be done to overcome the situation. As a result, the individual may leave the situation, commit acts of aggression, or engage in other antisocial behavior to cope with the situation. Empirical research has largely supported the relationships proposed in Spector's (1998) model (e.g., Frese & Zapf, 1988; Jex & Beehr, 1991; Johansson, Aronsson, & Lindstrom, 1978). Thus, I borrow heavily from this model to explain how challenge and hindrance stressors influence performance.

Problems with stress models

Most job stress models have assumed that job stress is a unidimensional construct and have measured it accordingly by collapsing across all stressors. As a result, studies on job stress have often found inconsistent results with regard to the relationship between stressors and work outcomes. As an example, Bretz, Boudreau, and Judge (1994) found that job stress did not predict job search as was expected. Furthermore, job stress was not related to ambition, job level, ascension, or employee quality ratings. Daniels and Guppy (1994) found job stressors were not related to job autonomy or participation in decision making. The weak relationships found between stressors and outcomes such as strains and performance in research may be explained by a weak relationship between stressors and work outcomes. However, the weak relationship seen may have been the result of the differential effects of stressors on performance that had not been accounted for. Researchers began to consider the multidimensionality of stressors and found support for differential effects of stressors on work outcomes. For example, Margolis, Kroes and Quinn (1974) found that role overload, a job stressor, was positively related to motivation to work and self-esteem. The results ran counter to what had been previously believed about stressors: that all stressors are harmful and have some sort of deleterious consequence. Cavanaugh, Boswell, Roehling, and Boudreau (2000) proposed two different types of stressors that potentially cancel out opposing effects when they are collapsed into a unidimensional measure.

Early stress research focused only on the negative consequences of job stress. However, Beehr and Newman (1978) posited that some stressors may inspire workers to make positive changes in their lives such as improving their diet, increasing physical activity, increasing religious activity, getting sufficient rest at night, and even quitting drug intake. Work stressors

may also be beneficial if they lead to changes on an organizational level. For example, if an organization is sensitive to workers' stress levels, organizations may implement improvements that benefit workers such as job redesign, changing existing evaluation/reward systems, modifying work schedules to accommodate employees' needs, thoroughly explaining criteria for promotions, improving communication, and providing feedback to employees to clarify role demands. Studies supported the theory that some stressors may have beneficial consequences for workers. For example, surveys of CEOs and high-ranking managers revealed that many noted how not all stress is bad and some stress can actually result in a competitive edge and force positive changes (e.g., Marino, 1997). One CEO claimed that stress from the job caused him to work harder to complete stressful tasks (Merelman, 1997). Managers reported that stressors such as time pressure were beneficial to work because they produced positive feelings along with the stress, and in the end were well worth the discomfort that was involved (McCall, Lombardo, & Morrison, 1988). Bogg and Cooper (1995) examined the relationship between sources of stress and various outcomes for senior civil servants and private sector executives and found that although private sector executives generally perceived more stress in the work environment, they manifested fewer stress outcomes (i.e., job dissatisfaction, poor mental and physical health) than did the senior civil servants. The results suggested that perceived stress may not necessarily always have negative consequences, and that different job levels may experience different stressors. As a result of the conflicting findings for the relationship between stress and outcomes, and the emergence of the possibility that some stressors may result in beneficial consequences, research in the area of job stress has begun to examine how the type of stressor may differentially affect performance (e.g., Cavanaugh et al., 2000; LePine et al., 2004; Wallace, Edwards, Arnold, Frazier, & Finch, 2009).

2-dimensional model of stress

Beehr and Newman's (1978) review of the job stress literature emphasized the possible existence of favorable consequences of job stress and suggested that these aspects should be further examined. The model of job stressors and their relation to employee health proposed in the review included an adaptive response facet that described several ways that a person could positively react to and cope with job stressors. The authors' model left open the possibility of beneficial, even healthy, consequences of job stress. The concept of beneficial stress existed in theory, but only recently has it been tested within a 2-dimensional framework of stressors and relationships with performance.

Selye (1982) wrote that eustress, or the "pleasant stress of fulfillment" would be most useful if it could be experienced without the harmful consequences of distress, or damaging stress (Selye, 1974). The 2-dimensional theory of stressors asserts that in addition to harmful stressors, there are also stressors that may improve performance and potentially promote achievements and gains (Lazarus & Folkman, 1984; LePine, LePine, & Jackson, 2004). Recent models of stress and performance have included the beneficial consequences of some types of stressors in addition to the negative outcomes that are often the focus of stress research (e.g., Cavanaugh et al., 2000; LePine et al., 2004; Podsakoff, LePine, & LePine, 2007). The two types of stressors identified by Cavanaugh, Boswell, Roehling, and Boudreau (2000) are challenge stressors and hindrance stressors. Challenge stressors are stimuli such as high workload, job demands, and job complexity that may enhance performance. Challenge stressors have been theorized to improve performance because they are suggested to trigger an active problem-solving style of coping (Lazarus & Folkman, 1984). For example, a study with college students found that stress due to looming college exams increased students' performance on cognitive

task-switching and Stroop tasks compared to performance during the relatively less stressful beginning of the semester (Kofman, Meiran, Greenberg, Balas, & Cohen, 2006). Research with manufacturing employees has shown that employee job demands are positively related to job satisfaction and negatively related to employee intentions to quit (Beehr, Glaser, Canali & Wallwey, 2001). In another sample of manufacture workers, quantitative workload was positively related to job satisfaction and negatively related to job absences (Dwyer & Ganster, 1991). Challenge stressors have also been positively related to motivation to learn (LePine et al., 2004).

Hindrance stressors are stimuli such as role ambiguity, role conflict, organizational politics, hassles, and red tape that hamper performance because they cannot be overcome with skill or effort expended. Hindrance stressors are suggested to initiate a passive, emotional coping style in which the person will try to escape the situation, or will simply give up (Lazarus & Folkman, 1984). Experimental studies have shown that anxiety from stressors reduces the effectiveness of information processing (e.g., Eysenck & Calyo, 1992) and skill acquisition (Ackerman, 1987; Anderson, 1987), suggesting that the anxiety produced by a hindrance stressor may be the cause of poor performance and the desire to withdraw from the situation. In stress research, hindrance stressors have been positively associated with physiological (Vagg & Spielberger, 1998; Ganster, Fusilier, & Mayes, 1986; Theorell & Karasek, 1996), behavioral (Spector & Jex, 1998; Fox & Spector, 1999), and psychological strains (Spector & Jex, 1998; Boswell, Olson-Buchanan, & LePine, 2004). Hindrance stressors hamper performance because they act like roadblocks that cannot be passed regardless of self-efficacy, motivation, effort, or any other factor. The worker who encounters a hindrance stressor perceives control and self-

efficacy for the relevant task to be low, and thus believes that nothing constructive can come from putting forth effort to overcome the stressor (Spector, 1998).

To test the different properties of challenge and hindrance stressors, Cavanaugh et al. (2000) developed a scale that included six challenge stressor items that asked workers to rate such categories as “the number of projects and/or assignments I have,” “the volume of work that must be accomplished in the allotted time,” and “time pressures I experience,” and five hindrance stressors including items rating “the amount of red tape I need to go through to get my job done,” “the inability to clearly understand what is expected of me on the job,” and “the degree to which politics rather than performance affects organizational decisions.” The participants were 1,886 U.S. managers who answered questions regarding job satisfaction, job search, and voluntary turnover, in addition to the questions about challenge and hindrance stressors in their work environment. The results showed that self-reported challenge stressors were positively related to job satisfaction and negatively related to job search. Conversely, hindrance stressors were negatively related to job satisfaction and positively related to job search and voluntary turnover. Experimental studies have also shown that challenge stressors may be related to increased satisfaction and performance. For example, a study using an anagrams task showed that when participants were divided into perceived high and low workload, those in the perceived high workload group rated enjoyment of the task higher and had higher rates of productivity compared to those in the perceived low workload group (Sales, 1970).

An abundance of support for the hindrance stressor-strain relationship exists, but there is far less evidence to support the advantageous effects of challenge stressors. The theory of challenge and hindrance stressors is relatively new and more research is needed to understand the complex relationships underlying the pathway between stressors and performance. The

distinction of challenge versus hindrance stressors has led to more focused stress research, but has not answered the questions of how and why challenge and hindrance stressors differentially affect performance, how stressors are perceived, or how workers choose to cope with challenge stressors and hindrance stressors. The model tested in the present study is based on the 2-dimensional model posited by Cavanaugh et al. (2000), but also includes control and self-efficacy as components of the appraisal process that may explain the differential relationships between challenge and hindrance stressors and performance.

Stressors initiate appraisal of control and self-efficacy. I posited that the presentation of a challenge stressor leads to high perceived control and self-efficacy for the task, which increases effort expended on the task, leading to successful performance. Conversely, a hindrance stressor leads to a low perception of self-efficacy and control, and decreased effort on the task, which leads to a decline in performance.

Objective versus perceived stressors

Beehr and Newman (1978) recommended that researchers measure work environment variables both objectively and subjectively to broaden the scope of job stressor research. Levine and Scotch (1970) suggested that the perception of a stimulus determines whether it is a stressor for each individual. Others proposed that the perception of a stimulus as a stressor is required in order for it to be linked to aversive health consequences (e.g., Kahn, Wolfe, Quinn, Snoek, & Rosenthal, 1964; House, 1974), and several studies supported the relationship between perceptions of stressors and worker health (e.g., Beehr, Walsh, & Taber, 1976; Caplan, Cobb, & French, 1975; Kahn et al., 1964; Lyons, 1971). The perception of a stressor may very well be what defines a stressor as a challenge or a hindrance and may explain their differential effects on performance.

Environmental job stressors—conditions in the environment—have been distinguished from perceived stressors—the interpretation and appraisal of potential environmental stressors. Both environmental stressors and perceived stressors were included as components of the job stress process model proposed by Spector (1998). Environmental job stressors can be any work situation or condition that is perceived as a stressor by the worker and enhances or degrades the worker's performance. Spector pointed out that job stressors include easily measured stressors such as job workload, which may be operationally defined as calories burned or number of assigned projects. Conversely, stressors may also include abstract concepts involving the perception of a stressor such as role ambiguity, defined as the uncertainty regarding the expectations of employees in their work role, which is not as easily quantified.

The perception of job stressors and the appraisal of the situation are closely tied and may involve a complex interplay of person-environment fit, perception of the job situation, workers' personality, resources, and perception of their own abilities (French, 1973). Consider a case in which two workers, employee A and employee B, encounter the same stressor, increased workload, to complete in the same period. Employee A perceives the workload as manageable because employee A is confident in his ability to complete the workload and perceives the workload as surmountable, whereas employee B perceives the workload as an overload because employee B has low perceived ability to complete the workload. The appraisal process resulted in workload being perceived differently for the two employees even though the objective workload and the allotted time were identical for both employees (Beehr & Newman, 1978). The process of appraisal includes the processes of assessing control over the situation, and perceiving self-efficacy for the task or situation (Spector, 1998). The appraisal process may involve many variables, but perceived control over the stressor (e.g., Karasek, 1979; Johnson & Hall, 1988;

Spector, 1998) and self-efficacy with regard to the stressor (e.g., Bandura, 1997; Spector, 1998) have been the two most commonly cited appraisal components involved in the relationship between stressors and strains. As such, I believe that control and self-efficacy are crucial to understanding how and why challenge and hindrance stressors are differentially related to performance.

Appraisal: Control and self-efficacy

Control is the ability to choose an action from two or more options (Ganster & Fusilier, 1989). The JDC (Karasek, 1979) model of stress theorizes that control moderates the relationship between work stressors and strains. Just as with environmental and perceived stressors, a distinction is made between environmental control and perceived control with environmental control being the degree of choice an individual is given and perceived control being the extent to which employees believe they have choice (Spector, 1998). Data from several studies have revealed that perceived control is related to motivation and supervisor-rated performance (Spector, 1986). For example, data from worker interviews showed that perceived job control was positively correlated with motivation to work, self-esteem, life satisfaction, job satisfaction, and overall physical health (Margolis, Kroes, & Quinn, 1974). Other studies indicated that perceived control may be a crucial link between job demands and health, including a study in which workload demands were found to interact with perceived control to predict health care costs for employees (Ganster, Fox & Dwyer, 2001). In the present study, perceived control was conceptualized as a component of task appraisal, and the appraisal was expected to directly affect effort levels, which in turn was predicted to affect performance (Figure 1). Perceived control, specifically perceived control over the stressor itself, is what affects how a person responds to a stressor (Spector, 1998). Situations in which perceived control is high lead to

increased motivation and effort intended to overcome the situation. Conversely, situations in which perceived control is low lead to decreased motivation and effort because the person believes that nothing can be done to overcome the situation (Spector, 1998). The stressor condition is expected to affect perceptions of control. Participants in the challenge stressor condition are expected to perceive a higher level of control than participants in the hindrance stressor condition. In addition to an expected mean group difference in perceived control between the challenge and hindrance conditions, it is also expected that perceived control will be one of the explanatory variables in the relationship between the stressor manipulation and performance.

> *Hypothesis 1*: Perceived control will be higher in the challenge stressor condition than in the hindrance stressor condition.

> *Hypothesis 2*: The relationship between the stressor manipulation and performance will be mediated by perceived control.

The belief that accomplishment is possible based on a person's capability is self-efficacy (Bandura, 1977; 1982). Leaders in organizations benefit from having high self-efficacy, and some have claimed that their stress levels decrease as their confidence to perform their job increases (Merelman, 1997). Self-efficacy should at least partially explain the differential relationships between stressors and performance because one of the fundamental attributes that differentiates stressors is that some are perceived to be surmountable (challenge) and some are perceived to be insurmountable (hindrance). Thus, to the extent that stressors are perceived to be surmountable, self-efficacy should increase whereas it should decrease as a result of stressors perceived to be insurmountable. Self-efficacy is also predicted to be one of the explanatory variables in the relationship between stressor manipulation and performance.

> *Hypothesis 3:* Self-efficacy will be higher in the challenge stressor condition than in the hindrance stressor condition.

Hypothesis 4: The relationship between the stressor manipulation and performance will be mediated by self-efficacy.

Motivation and effort

In addition to its relationship with control, self-efficacy beliefs are central to motivation and effort. People choose which challenges to pursue, how much effort to exert, and how long to persevere when confronted with obstacles based partly on self-efficacy beliefs in a given situation (Bandura, 2001). A situation in which success is nearly impossible (such as with hindrance stressors) should decrease perceived control and perceived self-efficacy and thus decrease the amount of effort allocated toward task completion. Conversely, challenge stressors increase perceived control and self-efficacy for the task which leads to a problem-focused and productive approach through increased effort expended to overcome the challenges of the task.

Changing effort level to coincide with a stimulus has been observed in human judgment processes in which people appear to automatically evaluate encountered stimuli as positive or negative, and rise to meet the challenge with high motivation when stimuli are positive, and retreat due to low motivation when stimuli are perceived as negative (Bargh, 1997; Osgood, Suci & Tannenbaum, 1957). Performing well or performing poorly on a task also appears to influence motivation. Förster, Grant, Idson, and Higgins (2001) conducted a study that provided feedback on an arm pressure task and found that success feedback for the task led to high motivation whereas failure feedback on the task led to low motivation. In a second study, Förster et al. (2001) found that participants persisted longer on an anagram task when they were provided with success feedback compared to failure feedback. Thus, when encountering a challenge stressor, success feedback is likely to increase motivation and effort directed toward overcoming the

challenge, whereas encountering a hindrance stressor leads to failure feedback, which then decreases motivation and decreases effort directed toward the task.

Expectancy theory (Vroom, 1964) has been used to explain the underlying process of how challenge and hindrance stressors elicit motivation and effort. First, the expected level of effort that will be required for a task is assessed (expectancy), then the task is appraised in terms of how likely it is for the person to be able to meet the requirements (instrumentality), and finally the predicted outcome is judged based on its attractiveness and value (valence) (Vroom, 1964; LePine, Podsakoff, & LePine, 2005). According to the expectancy theory approach, challenge stressors would be positively related to motivation and effort because there is a higher likelihood that the ability to succeed in the task is high, and the outcome of the task will be highly valued, so any effort involved in the task should be worth the extra energy exerted (LePine et al., 2005). For example, if time pressure is perceived as a challenge stressor, it is likely to be met with coping by increasing effort, and successfully coping with the pressure may increase a worker's sense of personal accomplishment and may even lead to rewards such as formal recognition from a superior. Any effort that may be expended to overcome hindrance stressors would probably not be useful because hindrance stressors are perceived as impossible to overcome regardless of effort. A worker may handle a hindrance stressor such as role conflict quite differently from a challenge stressor because the worker may realize that multiple requirements of the job cannot be satisfied simultaneously and an attempt to do so would sap valuable resources needed for effective performance. Thus, the worker does not exert effort to overcome the role conflict. As an example, role ambiguity (a hindrance stressor) has been negatively correlated with work motivation, and role overload (a challenge stressor) has been positively correlated with work

motivation (Margolis et al., 1974), supporting the idea that challenge and hindrance stressors have differential effects on workers and their motivation to put forth effort.

Three facets of effort were assessed: (a) on-task effort, (b) off-task effort, and (c) negative affect to gain a richer understanding of the level of focus people have under different stressor conditions. On-task effort measures the extent to which a person pays attention to the details of the task and strives to improve task performance. Off-task effort measures the level of distraction or irrelevant thoughts that interfere with performing a task. And negative affect is a measure of cognitive effort devoted to negative thoughts and feelings about the task and performance on the task. It is expected that on-task effort will be positively related to performance in both the challenge and hindrance stressor conditions because effort and performance accuracy have been shown to have a positive relationship (e.g., Johnson & Payne, 1985). However, the level of effort expended is expected to differ between the conditions so that on-task effort will be higher in the challenge stressor condition compared to the hindrance stressor condition. It is expected that the challenge stressor condition will lead to increased control, efficacy, and effort over the situation (compared to hindrance stressor) so participants in the challenge stressor condition should also stay on task more readily than participants in the hindrance stressor condition. Furthermore, because hindrance stressors are defined by situations that are out of one's control, participants should be more distracted (i.e., report more off-task thoughts) than in the challenge stressor condition. It is expected that participants in the hindrance stressor condition will invoke a more passive coping style in which an escape from the stressful situation is sought. The thoughts of escape may include thoughts that have nothing to do with the task at hand (i.e., off-task thoughts). Hindrance stressors should also lead to more negative affect because the difficult nature of the task was expected to increase the cognitive effort exerted

during the task, and this in turn may lead to negative feelings and thoughts. Thus, it was expected that off-task effort and negative affect would be lower in the challenge stressor condition compared to the hindrance stressor condition. The three sub-facets of effort were also expected to be explanatory factors in the stressor manipulation-performance relationship.

> *Hypothesis 5a*: On-task effort will be higher in the challenge stressor condition than in the hindrance stressor condition.
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> *Hypothesis 5b*: Off-task effort will be lower in the challenge stressor condition than in the hindrance stressor condition.
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> *Hypothesis 5c*: Negative affect will be lower in the challenge stressor condition than in the hindrance stressor condition.
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> *Hypothesis 6a:* The relationship between the stressor manipulation and performance will be mediated by on-task effort.
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> *Hypothesis 6b:* The relationship between the stressor manipulation and performance will be mediated by off-task effort.
>
> *Hypothesis 6c:* The relationship between the stressor manipulation and performance will be mediated by negative affect.

Stressor→performance

There is only one study that I am aware of that has manipulated challenge and hindrance stressors to assess how they are differentially related to performance. Pearsall, Ellis, and Stein (2009) manipulated stressor condition by applying time pressure and role ambiguity to create a challenge stressor condition and a hindrance stressor condition, respectively. The effects of stressor condition were assessed at the team level and two very different stressors were compared. Pearsall et al. found that teams in the challenge stressor condition performed significantly better on a decision making task than teams in the hindrance stressor condition, supporting the 2-dimensional stress model. Participants in the challenge condition reported higher levels of problem-solving coping (e.g., “We made a plan of action and followed it”) and

participants in the hindrance condition reported higher levels of avoidance coping (e.g., “My team wished the situation was over and would just go away”). Furthermore, coping style was found to mediate the relationship between stressor condition and performance in both the challenge and hindrance stressor conditions.

Research has yet to manipulate the same stressor to create a challenge or a hindrance and assess the differential effects of the stressor conditions at the individual level. To address the gap in the research, the present study will use a pay-off matrix design to create two conditions: challenge stressor and hindrance stressor, for a decision making task. Previous research on challenge and hindrance stressors has largely relied upon self-report data which has been instrumental in understanding the basic properties of stressors and how they are perceived by workers. However, the problem with self-report data on job stressors is that it does not explain the mechanisms underlying the relationship between stressors and work outcomes, and self-reports cannot determine causality in the relationship. Thus, a contribution of the current study was to examine the underlying mechanisms and causality of the stressor–performance relationship by experimentally manipulating challenge and hindrance stressors under controlled conditions and testing perceived control, self-efficacy, and effort as intervening variables.

The extent to which stressors are categorized as challenges or hindrances is often a function of one’s perception of the situation (Wallace et al., 2009). For example, time pressure or bureaucratic red tape may be perceived as a hindrance stressor if the capability and resources are not present to cope effectively. In contrast, time pressure and bureaucratic red tape may be perceived as challenges if capacity and resources (e.g., support) are present such that increased effort will overcome the stressors to complete the task at hand. Thus, in the present study I held constant the stressor, but manipulated perceptions of the stressor by manipulating rewards in a

specially designed pay-off matrix. The pay-off matrix created a challenge stressor condition by giving large monetary rewards for correct answers and making small monetary deductions for incorrect answers; thereby creating a pay scale that facilitated successful performance. Participants were told that success is defined as having a positive monetary balance. However, actual performance was defined by number of correct answers so that the money altered perceptions of the stress (i.e., to invoke the manipulation) but the dependent variable (i.e., points earned for correct answers) was not used to create the manipulation. A positive monetary balance, combined with positive feedback (via the money) following correct answers, was expected to increase perceived control and self-efficacy for the task, which should in turn increase on-task effort and thus improve performance on the task. Compared to the hindrance stressor condition, in the challenge stressor condition the rewards were larger relative to the deductions, so it was expected that performance would be better in the challenge stressor condition than in the hindrance stressor condition.

The pay scale in the hindrance stressor condition gave small monetary rewards for correct answers and made large monetary deductions for incorrect answers, thereby creating a pay-off system that made successful performance (defined as monetary rewards) nearly impossible. The negative feedback of losing more money than one gained was expected to decrease perceived control and self-efficacy for the task, which was expected to decrease on-task effort and thus ultimately degrade performance on the task. Compared to the challenge stressor condition, performance in the hindrance stressor condition should be lower due to the design of the pay-off matrix which made it more difficult to maintain a positive monetary balance in the hindrance condition than in the challenge condition. It is important to note that the potential number of points awarded for correct answers was the same for each condition, though the participants were

not aware of this aspect of the design. The only difference between the challenge and hindrance conditions was the monetary reward for correct answers and punishment for incorrect answers. Because of the differences in payout across the two conditions, only the secondary appraisals (i.e., control, self-efficacy, and effort) should have differed between the conditions (not the point totals) but the differences in appraisals were expected to yield differences in point totals (as defined by number of correct answers).

> *Hypothesis 7:* Performance will be higher in the challenge stressor condition than in the hindrance stressor condition.

Time pressure

Time pressure was incorporated in the design because it is a common element in workplaces and in many stressful occupations such as airline pilots (Chajut & Algom, 2003) and submarine officers (Kirschenbaum & Aruda, 1994). Research has shown that performance can improve as a result of heightened selective attention when stressors such as task difficulty and time pressure are present (Chajut & Algom, 2003). However, in several studies time pressure appeared to impair decision quality (e.g., Kerstholt, 1994; Rothstein, 1986; Wallsten & Barton, 1982). For example, studies on cognitive task decision making under time pressure suggested that time pressure may affect cognitive processes which are crucial in effective decision making (e.g., Kirschenbaum & Aruda, 1994). Time pressure has been shown to impair decision performance, but use of an improved strategy mitigated or eliminated the effect (Chu & Spires, 2001). The mixed results suggest that time pressure may increase or decrease decision making accuracy depending on the task environment. Incorporating time pressure into the study design may clarify its relationship with challenge stressors, hindrance stressors, and performance. For the purpose of a balanced design, time pressure was included as a manipulation in both stressor conditions. I expected that time pressure would degrade performance in both the challenge and

hindrance stressor conditions because the time pressure in the current study was acute, and may have inhibited learning on the decision making task.

> *Hypothesis 8:* There will be a main effect of time pressure on performance, with higher performance when no time pressure is present compared to when time pressure is present.

The study was a 2×2 design in which time pressure (with pressure/no pressure) and stressor condition (challenge stressor/hindrance stressor) were the independent variables and performance was the outcome. I had no reason to believe a priori that there would be an interaction between time pressure and stressor condition. Nevertheless, the design allowed for a test of potential interaction so the interaction was assessed, but I did not hypothesize an interaction.

Two of the most common problems with stress research—the use of self-report data for measuring both the "cause" and "effect" variables, and the use of correlational rather than experimental design to examine the relationship between stressors and outcomes (Beehr & Newman, 1978)—were addressed in the present study by using an experimental design to manipulate the stressor conditions. To date, most measures of challenge and hindrance stressors have been self-reports and correlational data that disallows making strong inference regarding direction of causation (Beehr & Newman, 1978) and does not give a complete understanding of the stressor–performance relationship. The present study was designed to elucidate the relationship between challenge stressors, hindrance stressors, and performance by experimentally manipulating challenge and hindrance stressors and observing the effects of the stressors on decision making performance. It was expected that self-efficacy and perceived control would be positively related to effort and that effort would be positively related to performance. However, because I expected these variables to explain the differential relationships between challenge and hindrance stressors and performance, the expected means and possibly the relationships would

differ across the two stressor conditions. Thus, the primary goal of this study was to experimentally manipulate challenge and hindrance stressor conditions to examine changes in self-efficacy and perceived control which should in turn affect effort and performance in the predicted directions.

Method

Participants

Ninety-five undergraduate students participated in the study. Extra credit was given in exchange for participation in the study.

Measures

Felt stress. Self-reports of felt stress were collected directly following the task. The measure of felt stress served as a manipulation check for the stressor condition manipulation. It was added to make sure that participants were feeling more stress in the hindrance stressor condition than in the challenge stressor condition. Participants were asked to rate the level of stress they experienced for five items (see Appendix). An example item was "Pressure to perform well on the task." Responses were made on a 5-point Likert-type scale (1 = no stress; 5 = very much stress). Felt stress was calculated by obtaining the mean of the scale items. High scores indicated a higher level of felt stress. Internal consistency reliability (i.e., coefficient alpha) for the felt stress scores was .83.

Perceived control. The control scale asked questions directly addressing perceived control of the task (see Appendix). Participants were asked to indicate the extent to which they agreed or disagreed with statements about how much control they felt they had during the task. Perceived control was calculated as a mean of the scale items, with higher scores indicating a higher level of perceived control. Internal consistency reliability (i.e., coefficient alpha) for the perceived control scores was .73.

Self-efficacy. Participants' self-efficacy was measured by eight items assessing self-efficacy with regard to the task (see Appendix). The items were developed according to guidelines for measuring self-efficacy suggested by Bandura (1994). Self-efficacy was calculated as a mean of the scale items, with higher scores indicating a higher level of perceived self-efficacy. Internal consistency reliability (i.e., coefficient alpha) for the self-efficacy scale was .84.

Effort. Participants' effort was measured by a modified version of the Task Focus Scale developed by Kanfer, Ackerman, Murtha, Dugdale, and Nelson (1994). The 13-item scale was broken down into three subscales: (a) on-task effort, (b) off-task effort, and (c) negative affect. The subscales were used to assess the level of effort exerted during the task (see Appendix). The on-task effort items measured how much participants were focusing on the task at hand and expending effort to improve their performance. Off-task effort items assessed the extent to which participants directed effort away from the task and were distracted by thoughts unrelated to the task. The negative affect items measured cognitive effort devoted to negative thoughts and frustration related to performance on the task. Responses were made on a 5-point Likert-type scale (1 = strongly disagree; 5 = strongly agree). All three effort subscale scores were calculated by reverse-scoring appropriate items and then obtaining the mean of the scale items. High scores indicated a higher level of on-task effort, off-task effort, or negative affect. Internal consistency reliability (i.e., coefficient alpha) for the on-task effort scores was .73; off-task effort scores was .70; negative affect scores was .77.

Task and procedure

The present study was a mixed design in which the challenge and hindrance stressor condition was a between-subjects variable and the time pressure was a within-subjects variable.

Participants were randomly assigned to one of two conditions: (a) challenge stressor condition or (b) hindrance stressor condition. Participants were given an informed consent form to sign which explained the general purpose of the experiment and thanked them for their involvement. During the training phase, participants were told that they would view pairs of photographs representing different U.S. cities. Participants were instructed to select the photograph that represented the city with the larger population (between the two cities presented on the screen). Participants received feedback after each choice. For correct choices, the word "Correct!" appeared on the screen, and the word "Incorrect" appeared for incorrect choices. Six U.S. cityscape photographs were used for the pairings. Several of the possible pairings (i.e., 18 pairings) were presented in the training phase so participants could learn the task. Following the training phase, all possible pairings (i.e., 30 pairings) were presented for two blocks of testing. Pairing combinations were randomly presented for the training phase and the two test blocks. Two blocks of testing were used in order to test the effects of time pressure on performance. Participants experienced time pressure in one block, and no time pressure in the other block, and time pressure was counter-balanced across the two blocks. Self report measures for perceived control, self-efficacy, and effort were presented in between the two blocks of trials.

In the testing blocks, participants were once again reminded that the goal of the task was to choose the larger city based on population size. The instructions stated that participants were now playing for real money and that they would receive the amount of money they earned at the end of the experiment. A pay-off matrix design was implemented to experimentally manipulate stressor type (challenge or hindrance). In the challenge stressor condition, participants were told that they would gain 5 cents for every trial answered correctly and would lose 1 cent for every trial answered incorrectly. Participants in the hindrance stressor condition were told they would

gain 1 cent for every trial answered correctly and would lose 5 cents for every trial answered incorrectly.

Performance

Participants in the challenge stressor and hindrance stressor conditions completed ratings for 60 pairings (or trials) total; or two blocks of 30 trials. Performance on the task was measured by number of trials answered correctly (1 = correct response; 0 = incorrect response). To provide feedback to the participants in real time, if an answer was correct the number of cent(s) awarded was added to the total on the feedback screen; if the answer was incorrect, the number of cent(s) deducted was subtracted from the total. The total money accumulated (a positive balance) or lost (a negative balance) appeared on the screen after each trial to maintain participants' awareness of their overall performance. The amount of money won or lost was used for the sole purpose of creating the challenge and hindrance stress conditions. To be fair, at the end of the experiment all participants were awarded the same amount of money, $3, regardless of condition. At the conclusion of the study all participants were debriefed and given credit hours.

Time pressure

Participants in the challenge stressor and hindrance stressor conditions completed two blocks of 30 trials. During the time pressure block participants were told they must answer each trial in less than 800 ms. The trial was coded as incorrect if no answer was given after 800 ms. During the no time pressure block, participants were told they would have as much time as they needed to answer each trial. The time pressure manipulation was a within-subjects design so that the effect of time pressure could be compared between the two stressor conditions (challenge and hindrance). Order of time pressure and no time pressure blocks was counter-balanced.

Data analyses

The means and standard deviations (presented in Table 1) and correlations (presented in Tables 2 and 3) for all study variables were used to test the hypotheses and present effect sizes. Structural equation modeling was used to test the hypothesized relationships presented in Figure 1. I first conducted a confirmatory factor analysis (CFA) using PROC CALIS to test the fit of the measurement models for perceived control, self-efficacy, and the three effort scales. To form the measurement models, I used the items as manifest indicators of the five latent variables: five items were loaded onto perceived control, eight items were loaded onto self-efficacy, five items were loaded onto on-task effort, four items were loaded onto off-task effort, and four items were loaded onto negative affect. An inspection of the distributional properties of the scale items showed trivial deviations from normality due to skewness (values did not exceed $\left|1.7\right|$) and kurtosis (values did not exceed $\left|2.8\right|$). Thus, based on rules of thumb for defining "extreme" skewness (e.g., absolute values greater than 2) and kurtosis (e.g., absolute values greater than 7; see West, Finch, & Curran, 1995), there were no departures from univariate normality.

Following Anderson and Gerbing (1988), I first tested the fit of the measurement models for the predictor variables. To scale the latent variables, the factor loading for the first item for each factor was arbitrarily set to 1.0. All other factor loadings and all error variances of the indicators and the covariances among the latent variables were freely estimated.

Model fit was assessed with the chi–square statistic and several other fit indices, such as the root mean square error of approximation (RMSEA; Steiger, 1990), Tucker–Lewis index (TLI; Tucker & Lewis, 1973), and comparative fit index (CFI; Bentler, 1990). The RMSEA is a parsimony–adjusted index that accounts for model complexity and was used to assess lack of model fit. RMSEA values less than .05 indicate close approximate fit, values between .05 and

.08 indicate a reasonable error of approximation, and values greater than .10 suggest a poor fit (Browne & Cudeck, 1993; Hu & Bentler, 1999). The TLI and CFI assess the relative improvement in fit compared to the independence model and are resistant to errors associated with sample size. Satisfactory models yield CFI and TLI values greater than .90 (Hu & Bentler, 1999).

Results

Means and standard deviations, by stressor condition, for study variables are presented in Table 1. Intercorrelations among the variables are also separated by condition with the challenge stressor condition presented in Table 2, and the hindrance stressor condition presented in Table 3. It is important to note here that the self-report ratings of perceived control, self-efficacy, and effort were made after Time 1, so half the participants based their ratings on performing the task under time pressure, and the other half of the participants based their ratings on performing the task with no time pressure. If participants got no time pressure first they gave higher ratings, but then received the time pressure at Time 2. If participants got time pressure first, they gave lower ratings, but then received no pressure at Time 2. As such, the ratings of perception were only relevant for Time 1 data. My analysis of the data showed that the time pressure was too difficult, and it overwhelmed the challenge/hindrance stressor manipulation. All measures of perceptions were collected after Time 1, and because time pressure was counterbalanced between Time 1 and Time 2, the measures were not relevant for Time 2 performance. Therefore, the decision was made to test the hypotheses involving the self-report measures (i.e., perceived control, self-efficacy, and effort) using only the Time 1 performance data because that was the only data that was directly relevant to the perceptions. For the sake of completeness, I included Time 2 data in the tables, but I did not interpret these data as a test of my hypotheses.

Measurement model

Overall fit statistics were derived using ML estimation. Overall fit of the measurement model was reasonably good, $\chi^2_{(289)} = 414.63$, $p < .0001$, RMSEA = .07 (90% CI = = .05 to .08),

TLI = .84, and CFI = .86. All 26 standardized factor loadings were statistically significant and standardized loadings ranged from .34 to .98 (M = .65, SD = .16).

Overall model test

The hypothesized model in Figure 1 was assessed using ML estimation to obtain accurate parameter estimates and significance tests and to obtain fit statistics by which to evaluate and compare the overall fit of the model. It should be noted that the sample size was deemed not large enough to estimate both the measurement and structural models so I decided to estimate only the structural model in this path analysis using the scale scores as the manifest indicators. The hypothesized statistical model is presented in Figure 1. Overall fit of the model was poor, $\chi^2_{(11)}$ = 80.42, *ns*, RMSEA = .26 (90% CI = = .21 to .32), TLI = -.12, and CFI = .41. Because the proposed path model was a poor fit to the data, the overall model was rejected and not used for further analyses[1].

Manipulation check (felt stress)

I created a self-report felt stress scale as a form of manipulation check for the two stressor conditions: challenge stressor and hindrance stressor. Participants in the challenge stressor condition reported feeling significantly less stress than participants in the hindrance stressor condition (t[93] = -4.66, p < .0001). These data provided evidence that the challenge/hindrance stressor manipulation worked as I had planned because participants' perceptions of felt stress were significantly different in the predicted direction.

Tests of hypotheses

I conducted a series of independent t-tests to test Hypotheses 1, 3, 5a, 5b, and 5c with stressor manipulation as the independent variable. Hypothesis 1 stated that perceived control

[1] The overall model fit poorly in both the challenge and hindrance stressor conditions, separately.

would be higher in the challenge stressor condition than the hindrance stressor condition. As shown in Table 1, there was a statistically significant difference in perceived control between the challenge stressor and hindrance stressor conditions (t[93] = 2.13, $p < .05$) with participants reporting more control in the challenge stressor condition. Thus, Hypothesis 1 was supported. Hypothesis 3 stated that self-efficacy would be higher in the challenge stressor condition than the hindrance stressor condition which was supported by the results (t[93] = 3.53, $p < .001$). Three facets of effort were measured: (a) on-task effort, (b) off-task effort, and (c) negative affect. In Hypothesis 5a, on-task effort was predicted to be higher in the challenge stressor compared to hindrance stressor condition. The difference between the challenge and hindrance conditions was not statistically significant for on-task effort (t[93] = 1.45, *ns*), so Hypothesis 5a was not supported. Hypothesis 5b stated that off-task effort would be lower in the challenge stressor condition compared to the hindrance stressor condition, but the difference was not statistically significant (t[93] = 1.83, *ns*). Thus, Hypothesis 5b was not supported. Finally, Hypothesis 5c predicted that negative affect would be lower in the challenge stressor condition than the hindrance stressor condition. When I compared negative affect between the challenge and hindrance stressor conditions, I found a significant difference between the two groups (t[93] = -5.01, $p < .01$) with significantly less negative affect reported in the challenge stressor condition than the hindrance stressor condition. Thus, Hypothesis 5c was supported.

Hypothesis 7 stated that performance would be higher in the challenge stressor condition than the hindrance stressor condition. However, there was no significant difference in performance between the challenge and hindrance conditions at Time 1 (t[93] = 1.30, *ns*) or at Time 2 (t[93] = .38, *ns*).

Tests of mediation

Though the overall model presented in Figure 1 was not a good fit to the data, I wanted to test if each of the intervening factors, separately, mediated the relationship between challenge stressor, hindrance stressor, and performance. I used the Baron and Kenny (1986) approach and Sobel's (1982) test to assess mediation. Baron and Kenny outlined four criteria necessary for a conclusion of mediation: (a) the independent variable is significantly related to the dependent variable; (b) the independent variable is significantly related to the mediator; (c) the mediator is significantly related to the dependent variable; and (d) in the presence of the mediator, the independent variable is not related to the dependent variable. These four criteria were assessed with four regression equations for each of the five proposed mediators. A conclusion of full mediation is warranted if the relationship between the independent variable and the dependent variable is zero, when controlling for the mediator. If the relationship between the independent and dependent variables reduces in size (compared to the bivariate relationship), but does not go to zero when the mediator is controlled, then partial mediation may be concluded. I also tested the significance of the indirect effect using Sobel's (1982) test of mediation. A test of mediation was conducted for each of the five proposed mediators, separately: (a) perceived control, (b) self-efficacy, (c) on-task effort, (d) off-task effort, and (e) negative affect.

Table 4 shows steps 1 and 4 of Barron and Kenny's test (1986) of mediation performed for each of the five proposed mediators. The relationship between the independent variable (i.e., the stressor manipulation) and the dependent variable (i.e., performance) was Step 1 for all the tests of mediation and was not statistically significant ($t = 1.30$, *ns*). Originally Baron and Kenny (1986) argued that if Step 1 was not statistically significant there was no need to proceed to the other steps. However, Kenny and others have since changed this stance, and have more recently

stated that it is acceptable to proceed with Steps 2-4 if Step 1 is not statistically significant because indirect effects can take many forms (e.g., suppression). Thus, I decided to test all the steps of mediation even though Step 1 was not statistically significant.

The steps for mediation for the intervening variables were conducted to test the hypotheses. Hypothesis 2 stated that the relationship between stressor manipulation and performance would be mediated by perceived control. There was no significant decrease in the unique variance explained by stressor condition (R^2 = .02 vs. ΔR^2 = .03; F = .83, *ns*) after controlling for perceived control. Sobel's test for the indirect effect of stressor condition on performance through perceived control was not statistically significant (Sobel = 1.34, *ns*), suggesting that perceived control did not mediate the stressor–performance relationship. Thus, Hypothesis 2 was not supported.

Hypothesis 4 stated that the relationship between stressor manipulation and performance would be mediated by self-efficacy. There was no significant decrease in the unique variance explained by stressor condition (R^2 = .02 vs. ΔR^2 = .09; F = .04, *ns*) after controlling for self-efficacy. However, Sobel's test for the indirect effect of stressor condition on performance through self-efficacy was statistically significant (Sobel = 2.34, $p < .05$), suggesting that self-efficacy mediated the stressor–performance relationship. Given that there was a reduction in the relationship between the stressor condition and performance, and that the Baron and Kenny (1989) approach to testing for mediation is notorious for being low-powered, I interpreted the results of Sobel's test of mediation to conclude that self-efficacy partially mediated the stressor–performance relationship. Thus, Hypothesis 4 was partially supported.

Hypothesis 6a predicted that the relationship between stressor manipulation and performance would be mediated by on-task effort. There was no significant decrease in the

unique variance explained by stressor condition (R^2 = .02 vs. ΔR^2 = .03; F = 1.11, *ns*) after controlling for on-task effort. Sobel's test for the indirect effect of stressor condition on performance through on-task effort was not statistically significant (Sobel = 1.09, *ns*), suggesting that on-task effort did not mediate the stressor–performance relationship. Thus, Hypothesis 6a was not supported.

Hypothesis 6b predicted that the relationship between stressor manipulation and performance would be mediated by off-task effort. There was no significant decrease in the unique variance explained by stressor condition (R^2 = .02 vs. ΔR^2 = .03; F = 1.25, *ns*) after controlling for off-task effort. Sobel's test for the indirect effect of stressor condition on performance through off-task effort was not statistically significant (Sobel = .87, *ns*), suggesting that off-task effort did not mediate the stressor–performance relationship. Thus, Hypothesis 6b was not supported.

Hypothesis 6c predicted that the relationship between stressor manipulation and performance would be mediated by negative affect. There was no significant decrease in the unique variance explained by stressor condition (R^2 = .02 vs. ΔR^2 = .04; F = .08, *ns*) after controlling for negative affect. Sobel's test for the indirect effect of stressor condition on performance through negative affect was not statistically significant (Sobel = 1.81, *ns*), suggesting that negative affect did not mediate the stressor–performance relationship. Thus, Hypothesis 6c was not supported.

Time pressure

Hypothesis 8 predicted a main effect of time pressure on performance, with performance being higher when no time pressure was present compared to when time pressure was present. I conducted a repeated measures 2 × 2 (challenge/hindrance stressor and time pressure/no time

pressure) ANOVA to test the hypothesis. The results showed that time pressure significantly affected performance ($F[1,93] = 175.59$, $p < .0001$) as expected with performance being higher when there was no time pressure present compared to when time pressure was present. Thus, Hypothesis 8 was supported.

Discussion

Research on the 2-dimensional model of stress has mostly tested the effects of challenge and hindrance stressors using self-report measures. Because challenge and hindrance stressors have not been experimentally manipulated, it has been impossible to determine causality in the stressor–performance relationships reported in previous research. Research has previously shown that challenge stressors can lead to improved performance and hindrance stressors can hamper performance (Pearsall et al., 2009). What is lacking is an examination of the intervening variables that cause the differential relationships observed between challenge stressors, hindrance stressors, and performance. In an attempt to explain the relationship between stressors and performance, I borrowed from Spector's (1998) model of job stressors in which perceived control and self-efficacy moderate the relationship between environmental stressors and perceived stressors. According to the framework, the perception of the stressor, the perceived control over the stressor, and self-efficacy all affect the relationship between job stressors and strains. I merged Spector's model of the variables that moderate the relationship between environmental and perceived stressors with Cavanaugh et al.'s (2000) 2-dimensional model of stressors to form a comprehensive model that would explain the differential relationships observed between challenge and hindrance stressors and performance as well as the intervening factors that influence the relationships. Thus, another contribution of the current study is that it examined the underlying mechanisms and causality of the stressor–performance relationship by experimentally manipulating challenge and hindrance stressors under controlled conditions and tested perceived control, self-efficacy, and effort as intervening variables.

To address the gap in the literature, the current study manipulated stressor conditions by creating challenge and hindrance stressor conditions through the use of a pay-off matrix that made the same task seem more difficult in the hindrance condition and easier in the challenge condition. A manipulation check was included to ensure that participants felt different levels of stress in the two conditions. The objectives of the study were to: (a) compare the differential effects of challenge stressor and hindrance stressor conditions on levels of perceived control, self-efficacy, and effort; (b) test perceived control, self-efficacy, and effort as potential mediators of the relationship between stressors and performance; (c) examine causality in the stressor–performance relationship by experimentally manipulating stressor conditions; and (d) measure the effect of time pressure on performance in the presence of challenge or hindrance stressors.

Felt stress was measured in both stressor conditions as a manipulation check. If participants felt more stress in the hindrance stressor condition compared to the challenge stressor condition it would suggest that the stressor conditions did in fact produce different levels of perceived stress. The results confirmed the success of the manipulation in that the participants in the hindrance stressor condition reported significantly more felt stress than those in the challenge stressor condition. Thus, it was concluded that the stressor manipulation worked as intended and created perceptions of stress in the predicted direction for each stressor condition.

Perceived control and self-efficacy were conceptualized as components of task appraisal, and the appraisal was expected to directly affect effort levels, which in turn was predicted to affect performance (Figure 1). The challenge stressor condition was expected to increase perceptions of control, self-efficacy, and effort intended to overcome the situation. The hindrance stressor condition was expected to decrease perceptions of control, self-efficacy, and effort because the person believes that nothing can be done to overcome the situation (Spector,

1998). As predicted, the results showed higher levels of perceived control and self-efficacy in the challenge stressor condition compared to the hindrance stressor condition. Negative affect was lower in the challenge stressor condition than the hindrance stressor condition, which was also expected due to the hindrance stressor condition leading to more negative perceptions toward the task than the challenge stressor condition. The differences in on-task effort and off-task effort between the stressor conditions were not significant, though the scores for on-task effort were slightly higher in the challenge condition compared to the hindrance stressor condition (d = 0.30), as predicted. The five intervening variables (perceived control, self-efficacy, on-task effort, off-task effort, and negative affect) were tested as mediators in the stressor–performance relationship. The results showed that self-efficacy partially mediated the stressor–performance relationship. The results for perceived control, on-task effort, off-task effort, and negative affect as mediators were not statistically significant. It is important to note that the relationship between stressor condition and performance was not statistically significant, which may partially account for the null results regarding the intervening variables. In short, there was little variance (i.e., R^2 = .02) in the direct effect to account for with the intervening variables.

Empirical research has shown that challenge stressors may improve performance and hindrance stressors may hamper performance (Cavanaugh et al., 2000; Pearsall et al., 2009; Wallace et al., 2009). Thus, Hypothesis 7 proposed that performance would be higher in the challenge stressor condition than the hindrance stressor condition. The results showed that there was no difference in performance between the challenge and hindrance stressor conditions so it was concluded that the objective of finding a difference in performance between the challenge and hindrance stressor conditions was not met. A potential explanation for the lack of difference in performance between the challenge and hindrance stressor conditions is that the attributions

given to the stressors (i.e., the perception of the stressors) may have affected performance more than the stressor itself. Previous models of job stress emphasize the role of appraisal as perhaps being more important for performance than the actual environmental stressor (Lazarus, 1981; Spector, 1998). In other words, any environmental stressor may be a challenge or a hindrance stressor; it depends on the perception of the stressor as either a challenge or a hindrance. And, it is this perception (or appraisal) that influences performance. In support of this conclusion, the results showed that felt stress and performance were significantly correlated in the hindrance stressor condition (Time 1: r = -.39; Time 2: r = -.47). Furthermore, levels of felt stress were higher in the hindrance stressor condition compared to the challenge stressor condition at Time 1 (Challenge: M = 2.33, SD = .66; Hindrance: M = 3.02, SD = .78; d = -.96) and Time 2 (Challenge: M = 2.67, SD = 1.06; Hindrance: M = 3.04, SD = .88; d = -.38), which supports appraisal theories of stress.

The current study included the variable time pressure, which was expected to add a deeper understanding regarding the challenge and hindrance stressor framework because time pressure has been described as both a challenge and a hindrance in the literature (e.g., Chajut & Algom, 2003; Kerstholt, 1994; Rothstein, 1986; Wallsten & Barton, 1982). As expected, time pressure led to a decrease in performance in both stressor conditions. Time pressure was established at 800 ms during pilot testing. However, after examining the results of the study it became clear that the time pressure was too intense because participants were resorting to guessing when they answered. The results revealed a random pattern of answering under time pressure, so it seems that participants did not have enough time to learn the city pairings, and instead were answering as quickly as they could.

It is possible that the stressor manipulation was not effective due to interference from time pressure. The addition of time pressure for half of the trials may have affected the results because the time pressure was so intense that it inhibited learning. The time pressure rendered the stressor condition manipulation (i.e., the pay-off matrix) ineffective when time pressure was present; both conditions were essentially hindrance stressor conditions because participants could not overcome the stressor with increased effort. That is, there was not enough time to employ a problem-solving coping strategy. I concluded that time pressure evened the playing field for participants in the challenge and hindrance conditions by making the task equally difficult in both conditions. The point of the stressor condition manipulation was to make the task more difficult in the hindrance condition, but the time pressure also unexpectedly interfered with the challenge stressor manipulation. Participants focused only on the time pressure when it was present in both stressor conditions. It is possible that the participants did not have enough time to think about the money they were accumulating or losing, thus rendering the pay-off matrix manipulation ineffective. Given the nature of my research design, I was able to test this conclusion by comparing the felt stress data from the challenge and hindrance stressor conditions with no time pressure at Time 1 (Challenge: M = 2.16, SD = .59; Hindrance: M = 2.70, SD = .54; d = -.95). These data indicated that the stressor manipulation did work as expected because in the absence of time pressure participants in the hindrance stressor condition reported significantly more stress than participants in the challenge stressor condition. Also, when one examines performance at Time 1 when there was no time pressure, performance was higher in the challenge stressor condition compared to the hindrance stressor condition (Challenge: M = .76, SD = .08; Hindrance: M = .72, SD = .09; d = -.35), which supports Hypothesis 7 and is consistent with previous research (i.e., Pearsall et al., 2009). When one examines performance at Time 1

when time pressure was present, it appears that the stressor condition manipulation was overwhelmed by the time pressure because performance in both stressor conditions was close to chance and there was no significant difference in performance between the conditions (Challenge: M = .57, SD = .12; Hindrance: M = .57, SD = .10; d = 0). Thus, it was concluded that the time pressure interfered with the manipulation. My conclusion also extends to tests of the intervening variables because those data were collected after Time 1 and thus were a response to the time pressure manipulation as much as to the stressor manipulation.

Theoretical and practical implications

The model (Figure 1) was not supported by the empirical data, but the data was determined to be uninterpretable due to time pressure overwhelming the stressor condition manipulation. The model was based in theory by well-supported models of job stress (Spector, 1998; Cavanaugh et al., 2000), but the empirical data in the present study were problematic due to the time pressure. Thus, it was concluded that the theory of the model was sound, but the empirical data were problematic. If time pressure was eliminated from the study design, the data may have supported the proposed model.

Implications of the findings include the result that appraisal of a stressor (i.e., felt stress) was affected by manipulating stressors. Additionally, challenge stressors led to higher levels of perceived control and self-efficacy and lower levels of negative affect when compared to hindrance stressors. The results also indicated that time pressure can inhibit learning on a decision-making task. If time pressure is too intense, performance suffers regardless of the circumstances. The results of the current study showed that performance suffered when intense time pressure was present because there was not enough time for learning to occur. It is particularly important to take this finding into consideration when applying it to organizational

settings. For example, if workers are pushed to complete training within an unreasonably short time period, then learning may suffer. As a result, job performance may suffer, and accidents and safety violations may increase, which can lead to increased costs and decreased production. The results of the study also indicated that people are sensitive to differences in stressor conditions, with felt stress being higher in reaction to hindrance stressors compared to challenge stressors. Thus, it is important to be cognizant of stressors in the work environment, and to strive to reduce hindrance stressors as much as possible to decrease worker strains and organizational costs (e.g., production losses, increased health care expenses).

Limitations and future research directions

The data with time pressure were uninterpretable. The addition of time pressure overwhelmed the challenge/hindrance stressor manipulation (because it was too rapid), so there was no learning occurring in the time pressure blocks. Only 25 people had interpretable data (i.e., data with no time pressure at Time 1). Based on my pilot testing and experience with the task in the lab, it was determined that 800 ms was an adequate time. But the empirical data showed that 800 ms was not enough time, so in hindsight I realize that the time pressure was too intense. Participants did not have time to learn because the 800 ms in each trial was not enough for participants to truly learn the cities' relative population sizes. However, the data with time pressure at Time 1 was included in the analyses because it provided useful information about how and why the time pressure affected the manipulation. The Time 2 data were not included in the analyses because the self-report measures were not relevant to the Time 2 data. The self-report measures were taken at Time 1, and so all the data obtained from the self-report measures (i.e., perceived control, self-efficacy, on-task effort, off-task effort, and negative affect) were in response to Time 1 data, and not to Time 2 data; because the reports were in response to the time

pressure condition at Time 1 which was different at Time 2. The other measures—felt stress and performance—were taken at both Time 1 and Time 2 so these measures were reported for both times.

A follow-up study is currently being planned that will address the limitations of the original experiment. The methodology will be very similar to the current study with participants going through a training phase and then two test phases in which they play for money. The pay-off matrix manipulation will be used to create a challenge and a hindrance stressor condition which will again be a between-subjects variable. However, the study will eliminate time pressure so that the challenge/hindrance stressor manipulation can be more accurately assessed. A scale assessing perceptions of the challenge and hindrance stressor manipulation will be added to the protocol to gain a fuller understanding of how participants perceive the challenge and hindrance conditions and the extent to which they feel that the condition is a challenge or a hindrance. A measure of coping strategies will also be added. The coping scale will measure the extent to which participants engage in problem-solving coping or avoidant coping strategies to deal with the decision-making task. The self-report measures: perceived control, self-efficacy, on-task effort, off-task effort, negative affect, perception of challenge and hindrance stressors, and coping will be presented after the first and second test blocks. It is expected that those in the challenge stressor condition will report higher levels of problem-solving coping because the task will be perceived as a challenge that may be overcome with increased effort. Levels of avoidant coping are expected to be higher in the hindrance stressor condition because the difficulties of the task should lead participants to look for a way to escape the situation.

Conclusions

There is only limited research experimentally testing the differential effects of challenge and hindrance stressors and the effects of the stressors on performance. There is also a need for research examining the intervening factors affecting the relationship between challenge stressors, hindrance stressors, and performance. To address the gap in the literature, the current study experimentally manipulated one variable, a pay-off matrix, to create a challenge stressor condition and a hindrance stressor condition and compare performance across conditions. The primary objectives of the study were to: (a) compare the differential effects of challenge stressor and hindrance stressor conditions on levels of perceived control, self-efficacy, and effort; (b) test perceived control, self-efficacy, and effort as potential mediators of the relationship between stressors and performance; (c) examine causality in the stressor–performance relationship by experimentally manipulating stressor conditions; and (d) measure the effect of time pressure on performance in the presence of challenge or hindrance stressors. From the results of this study and work by Pearsall et al. (2009), it is evident that experimentally manipulating challenge and hindrance stressors can effectively influence the level of stress that people experience. Thus, it is possible to test the differential effects of challenge and hindrance stressors in a laboratory setting.

As expected, levels of perceived control and self-efficacy were higher in the challenge stressor condition compared to the hindrance stressor condition. Negative affectivity was lower in the challenge condition than the hindrance condition which was also hypothesized. There was partial support for self-efficacy mediating the relationship between stressor condition and performance. However, the results suggested that perceived control, on-task effort, off-task effort, and negative affectivity did not mediate the stressor–performance relationship. The results

of the study showed that performance did not differ across stressor conditions as expected. It was determined that the lack of difference may have been a result of time pressure overwhelming the stressor manipulation. Finally, time pressure affected performance in the expected direction, with performance being worse when time pressure was present than when time pressure was absent.

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Table 1. Means and standard deviations by stressor condition.

	Challenge Condition		Hindrance Condition		
Variable	*M*	*SD*	*M*	*SD*	Cohen's *d*
Perceived Control	3.26	0.71	2.93	0.76	0.45*
Self-Efficacy	3.74	0.49	3.31	0.69	0.73**
On-Task Effort	3.61	0.60	3.40	0.79	0.30
Off-Task Effort	2.08	0.68	1.82	0.71	0.37
Negative Affect	2.55	0.66	3.38	0.94	-1.04**
Felt Stress (Time 1)	2.33	0.66	3.02	0.78	-0.96**
Felt Stress (Time 2)	2.67	1.06	3.04	0.88	-0.38
Performance (Time 1)	0.67	0.14	0.64	0.12	0.23
Performance (Time 2)	0.68	0.12	0.64	0.14	0.31

Note: Challenge stressor condition $n = 49$. Hindrance stressor condition $n = 46$. *$p < .05$, **$p < .01$.

Table 2. Correlations for Challenge Stressor Condition

Indicator	1	2	3	4	5	6	7	8	9
1. Perceived Control	—								
2. Self-Efficacy	.52**	—							
3. On-Task Effort	.44**	.42**	—						
4. Off-Task Effort	-.14	-.16	-.07	—					
5. Negative Affect	-.21	-.27	-.06	-.06	—				
6. Felt Stress (Time 1)	-.06	.16	.21	-.28*	.35*	—			
7. Felt Stress (Time 2)	-.03	.35*	.37**	.01	.19	.56**	—		
8. Performance (Time 1)	.15	.37**	.17	.26	-.28*	-.11	.42**	—	
9. Performance (Time 2)	-.01	.09	.02	-.13	.01	.24	-.24	-.11	—

Note: N = 49. *$p < .05$, **$p < .01$.

Table 3. Correlations for Hindrance Stressor Condition

Indicator	1	2	3	4	5	6	7	8	9
1. Perceived Control	—								
2. Self-Efficacy	.36*	—							
3. On-Task Effort	.30*	.32*	—						
4. Off-Task Effort	-.13	-.23	-.15	—					
5. Negative Affect	.03	-.29*	.21	.14	—				
6. Felt Stress (Time 1)	-.14	.05	-.05	.03	.45**	—			
7. Felt Stress (Time 2)	-.10	-.02	.24	.20	.17	.17	—		
8. Performance (Time 1)	.21	.28	.18	.08	-.14	-.39**	.31*	—	
9. Performance (Time 2)	.12	.29*	.03	-.21	.11	.20	-.47**	-.12	—

Note: N = 46. *$p < .05$, **$p < .01$.

Table 4. Results of mediation tests of Hypotheses 2, 4, and 6a-c

Hypothesis	Dependent Variable	Independent Variable	β	R^2	ΔR^2
2	Performance	Stressor Condition	.03	.02	
	Performance	Stressor Condition	.02	.02	
		Perceived Control	.03	.05	.03
4	Performance	Stressor Condition	.03	.02	
	Performance	Stressor Condition	.01	.02	
		Self-Efficacy	.07	.11	.09
6a	Performance	Stressor Condition	.03	.02	
	Performance	Stressor Condition	.03	.02	
		On-Task Effort	.03	.05	.03
6b	Performance	Stressor Condition	.03	.02	
	Performance	Stressor Condition	.03	.02	
		Off-Task Effort	.03	.05	.03
6c	Performance	Stressor Condition	.03	.02	
	Performance	Stressor Condition	.01	.02	
		Negative Affect	-.03	.06	.04

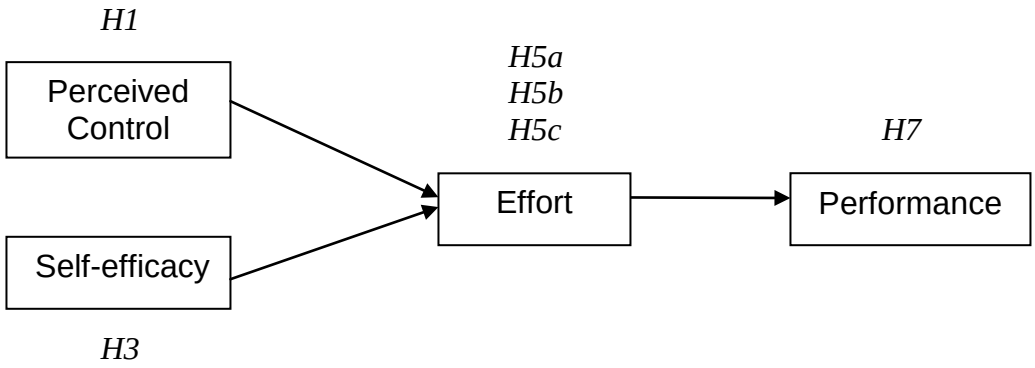

Figure 1. Theoretical model of the relationship between perceived control, self-efficacy, effort, and performance. *H1*, *H3*, *H5a*, *H5b*, *H5c*, and *H7* represent the hypotheses being tested between the challenge and hindrance stressor conditions for each factor in the model.

Appendix

FELT STRESS

INSTRUCTIONS

You will now be asked to indicate the extent to which each of the following statements produced stress with regard to the task you just completed. Responses will be made by pressing the '1', '2', '3', '4', or '5' keys on the number pad on the right side of the keyboard. Now, take time to locate the '1', '2', '3', '4', and '5' keys on the number pad.

No Stress	**Little Stress**	**Some Stress**	**Quite a Bit of Stress**	**Very Much Stress**
1	2	3	4	5

1	Pressure to perform well on the task.	1 2 3 4 5
2	The reward system for correct and incorrect answers.	1 2 3 4 5
3	The city decision task.	1 2 3 4 5
4	Overall stress from the task.	1 2 3 4 5
5	The time pressure.	1 2 3 4 5

PERCEIVED CONTROL

INSTRUCTIONS

You will now be asked to indicate the extent to which you agree or disagree with statements about how much control you felt you had during the task. Responses will be made by pressing the '1', '2', '3', '4', or '5' keys on the number pad on the right side of the keyboard. Now, take time to locate the '1', '2', '3', '4', and '5' keys on the number pad.

Strongly Disagree	**Somewhat Disagree**	**Neither Agree Nor Disagree**	**Somewhat Agree**	**Strongly Agree**
1	2	3	4	5

1	I had control over how well I performed on the task.	1 2 3 4 5
2	I could control how well I scored on the task.	1 2 3 4 5
3	I felt in control of how much money I won.	1 2 3 4 5
4	In general, I was in control of what happened in the task.	1 2 3 4 5
5	I could predict the outcome of my actions on the task.	1 2 3 4 5

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Smith, C. S., Tisak, J., Hahn, S. E., & Schmieder, R. A. (1997). The measurement of job control. *Journal of Organizational Behavior, 18,* 225-237.

SELF-EFFICACY

INSTRUCTIONS

You will now be asked to indicate the extent to which you agree or disagree with statements about your performance on the task. Responses will be made by pressing the '1', '2', '3', '4', or '5' keys on the number pad on the right side of the keyboard. Now, take time to locate the '1', '2', '3', '4', and '5' keys on the number pad.

Strongly Disagree	**Somewhat Disagree**	**Neither Agree Nor Disagree**	**Somewhat Agree**	**Strongly Agree**
1	2	3	4	5

1	I possess the skills necessary to succeed on the task.	1	2	3	4	5
2	I believe I can perform even better at the task with more practice.	1	2	3	4	5
3	My performance on the task is a reflection of the effort I put forth.	1	2	3	4	5
4	I have the skills necessary to earn money on the task.	1	2	3	4	5
5	Compared to other people, I expect to perform well on the task.	1	2	3	4	5
6	I am able to successfully overcome the challenges of the task.	1	2	3	4	5
7	I feel confident in my ability to perform the task.	1	2	3	4	5
8	I am certain that I will do well on the task.	1	2	3	4	5

Bandura, A. (1994). Self-efficacy. In V. S. Ramachaudran (Ed.). *Encyclopedia of human behavior* (Vol. 4, pp. 71-81). New York: Academic Press.

Chen, G., Gully, S. M., & Eden, D. (2001). Validation of a new general self-efficacy scale. *Organizational Research Methods, 4,* 62–83.

EFFORT

INSTRUCTIONS

You will now be asked to indicate the extent to which you agree or disagree with statements about how much effort you exerted during the task. Responses will be made by pressing the '1', '2', '3', '4', or '5' keys on the number pad on the right side of the keyboard. Now, take time to locate the '1', '2', '3', '4', and '5' keys on the number pad.

Strongly Disagree	**Somewhat Disagree**	**Neither Agree Nor Disagree**	**Somewhat Agree**	**Strongly Agree**
1	2	3	4	5

1	I paid close attention to the kind of errors I was making. (On-Task)	1 2 3 4 5
2	I focused my attention on whatever was going wrong. (On-Task)	1 2 3 4 5
3	I focused my attention on learning a specific rule. (On-Task)	1 2 3 4 5
4	I thought about new strategies for improving my performance. (On-Task)	1 2 3 4 5
5	I thought ahead to what I would do next to improve my performance. (On-Task)	1 2 3 4 5
6	I daydreamed while doing the task. (Off-Task)	1 2 3 4 5
7	I lost interest in the task for short periods. (Off-Task)	1 2 3 4 5
8	I thought about other things that I have to do during the task. (Off-Task)	1 2 3 4 5
9	I became frustrated with my inability to improve my performance. (Negative Affect)	1 2 3 4 5
10	I thought about how poorly I was doing during the task. (Negative Affect)	1 2 3 4 5
11	I am satisfied with my overall performance on the task. ® (Negative Affect)	1 2 3 4 5
12	I got mad at myself during the task. (Negative Affect)	1 2 3 4 5
13	I thought about things that happened in the recent past (last few days). (Off-Task)	1 2 3 4 5

® Item was reversed scored

Kanfer, R., Ackerman, P. L., Murtha, T. C., Dugdale, B. & Nelson, L. (1994). Goal setting, conditions of practice and task performance: A resource allocation perspective. *Journal of Applied Psychology, 79,* 826-835.