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ADAPTIVE PERFORMANCE:

AN EXAMINATION OF CONVERGENT AND PREDICTIVE VALIDITY

A dissertation submitted in partial fulfillment of the
requirements for the degree of
Doctor of Philosophy

By

CHARLENE K. STOKES
M.S., Wright State University, 2004

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WRIGHT STATE UNIVERSITY

SCHOOL OF GRADUATE STUDIES

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I HEREBY RECOMMEND THAT THE DISSERTATION PREPARED UNDER MY SUPERVISION BY Charlene K. Stokes ENTITLED Adaptive Performance: An Examination of Convergent and Predictive Validity BE ACCEPTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF Doctor of Philosophy.

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ABSTRACT

Stokes, Charlene K. Ph.D., Human Factors and Industrial/Organizational Psychology Program, Wright State University, 2008.
Adaptive Performance: An Examination of Convergent and Predictive Validity.

The purpose of the present study was twofold: 1) to examine the convergent validity of the two foremost measurement methods, subjective and objective, used to assess adaptive performance; and 2) to examine the predictive validity of variables across measurement methods using a path model framework. Specifically, various dispositional traits are posited to influence adaptive performance through the mediating mechanisms of stress appraisals and self-efficacy. Beyond examining the potential causal paths associated with predictors, the study included a commensurate focus on adaptability as an outcome and addressed the measurement issues that surround adaptive performance. Participants (N = 275) in teams of five completed a task, the Computer-based Aerial Port Simulation (CAPS; Lyons, Stokes, Palumbo, Boyle, Seyba, & Ames, 2008), that included a disturbance during the second session, which required an adaptive response. In addition to assessing adaptive performance as objective task scores following the disturbance, peer and self ratings of adaptive performance were assessed. Marginal support was found for the convergent validity of adaptive performance measures; r = .52 for subjective and objective adaptive performance. Given the marginal support, as opposed to a composite measure for adaptive performance, all hypotheses were examined using both subjective and objective measures in separate analyses. Results supported the posited path model,

and indicated that stress appraisals and self-efficacy mediate the relationship between dispositional traits and adaptive performance. This mediated relationship was supported across divergent measurement methods for adaptive performance. The results provide initial support for two previously unexplored areas in adaptive performance research: 1) stress appraisals as a predictor of adaptive performance, and 2) the mediating effects of self-efficacy and stress appraisals. The results offer promising applied implications for selection based on the supported dispositional traits, and training interventions based on the self-regulatory aspects of stress appraisals and self-efficacy. In terms of theoretical implications, the results of the present study direct attention to the construct validity of adaptive performance and suggest caution in interpreting previous research results in the area. Future research is needed that thoroughly examines the construct validity of adaptive performance and confirms if results are indeed generalizeable across measurement methods, and beyond.

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I. INTRODUCTION

We have learned that…the past will be a poor guide to the future and that we shall forever be dealing with unanticipated events. Given that scenario organizations…will need ***individuals*** *(emphasis mine) who delight in the unknown.*

- Charles Handy

Numerous researchers, academic and applied, have commented on the dramatic changes occurring in jobs and organizations today (Borman & Motowidlo, 1993; Haeckel, 1999; Ilgen & Pulakos, 1999; Quinones & Ehrenstein, 1997; Weiss, 1991). A few of the paramount changes that are often cited include team-based jobs, technology influx, global competition, and cultural diversity. Such changes have placed an increased demand on workers to be adaptable in the face of the constant change that now characterizes their work environment (Chan, 2001). Indeed, many of the same researchers citing changes in the nature of work often recommend adaptability as a way to cope with the changes that are occurring (Ilgen & Pulakos, 1999). Organizations are increasingly implementing adaptive organizational designs (Haeckel, 1999; Thach & Woodman, 1994), implementing adaptive information technology (Rasmussen, Pejterson, & Goodstein, 1994; Vicente, 1999), and calling for adaptive performance from workers (Allworth & Hesketh, 1999; Griffin & Hesketh, 2003; Ilgen & Pulakos, 1999). Although numerous authors have noted the importance of adaptability, a consistent definition and

understanding of adaptability is difficult to pinpoint in the literature. As adaptability appears to be a foundational aspect of work today (Borman & Motowidlo, 1993; Haeckel, 1999; Ilgen & Pulakos, 1999; Quinones & Ehrenstein, 1997; Weiss, 1991), it is imperative that a thorough and shared understanding of the construct 'adaptive performance' be developed if researchers are to achieve the goals of measurement, prediction, and training.

Therefore the intent of the present research was to cement the foundation for this shared understanding of adaptive performance and substantiate its efficacy as a dimension of the job performance domain. As an overview, the various issues that surround the construct of adaptive performance are discussed first. One of the paramount concerns is the diversity in approaches and conceptualizations. It is important to acknowledge this diversity up front as it is the primary contributor to the lack of shared understanding and the equivocal findings often reported. Furthermore, we must be aware that many of the findings reported in regard to predictors of adaptive performance have emerged from different backgrounds. The individual difference literature and the training literature represent the two primary research areas and will be discussed in turn, followed by an effort to unify the two approaches. After reviewing the hodgepodge of research findings from these two literatures, the need for a shared understanding of adaptive performance will be evident. In response, the Adaptive Job Performance taxonomy (Pulakos, Arad, Donovan, & Plamondon, 2000) is presented, which is a validated model of job performance that has received sparse attention. This model captures the essence of adaptive performance, and therefore has the potential to provide the shared understanding of the construct that is needed to unify future research efforts. Focusing on the predictors

of adaptive performance, the themes and limitations apparent in the previous research findings are identified. These themes and limitations will serve to organize the hypotheses presented. With the Adaptive Job Performance taxonomy as a basis, the proposed hypotheses, including a predictor model for the examination of adaptive performance are presented.

Diversity in Approach and Conceptualization

One reason for the lack of a consensus in defining and understanding adaptability may be attributable to the differing approaches, perspectives, and literatures used to address the concept. The term 'adaptability' is an amorphous notion that can be viewed from numerous angles and applied in numerous domains. For example, the business management literature views adaptability from an organizational level, often proposing 'adaptive' organizational design solutions (Haeckel, 1999; Parhankangas, Ing, Hawk, Dane, & Kosits, 2005; Thach & Woodman, 1994). Other researchers focus on 'adaptive' information technology (IT) solutions (Rasmussen, Pejterson, & Goodstein, 1994; Vicente, 1999). Therefore, it is important to clarify the substantive context used when conducting research regarding adaptability. For the present study, adaptability, more specifically adaptive job performance, is investigated at the individual level and defined as the process by which individuals achieve a degree of fit between their behaviors and the work demands created by novel and often ill-defined problems occurring in work situations (Chan, 2001). Adjusting one's behavior or appearance to comply with or show respect for others' values and customs (Pulakos, Arad, Donovan, & Plamondon, 2000), which is imperative to succeed in global business, is one example of adaptability under this definition.

Although the focus of the present research is at the individual level, all levels and approaches to research on adaptability share the objective of increasing adaptability or flexibility in some manner, be it through organizational structure, information technology, or individual behavior, as examples. Adaptability has become a fundamental element of work because much of the stability and predictability inherent in previous work environments has been eliminated (Haeckel, 1999; Ilgen & Pulakos, 1999). It is important to recognize that no single approach will suffice. Rather, all approaches are needed and should be considered complementary to gain a complete understanding of how to meet demands imposed by the new work environments. Ultimately, research on adaptability requires a systems perspective as it permeates across multiple levels of analysis. Although all levels are relevant and most appropriately considered in union, the present research is guided by the notion that the individual level is the fundamental building block for all other approaches and levels regarding adaptive performance. In other words, adaptive people are necessary for an adaptive structure or adaptive technology to work optimally. Structure and technology are intended to support the people who are required to "finish the design" locally as a function of the situated context (Vicente, 1999). With increased responsibility and discretion placed on workers, individuals have become the frontline, bearing the ultimate burden of adapting to the changing nature of work. Unlike past work environments, where much could be planned in advance, workers today must have the knowledge, skills, and abilities to respond quickly to immediate novel demands (Haeckel, 1999; Ilgen & Pulakos, 1999). Often included in this response is the knowledge and ability to utilize the flexible technology support to its fullest and to appropriately modify organizational or group structures (e.g.,

use of net-centric structure designs; Cares, 2005) when the environment demands it. The following describes examples of two levels, organizational structure and information technology, which both highlight the importance of the individual regardless of the level of research focus.

Organizational Structure

Haeckel (1999) suggested the need to move beyond what he termed the old make-and-sell approach (i.e., closed system in a predictable environment) to a sense-and-respond business model (i.e., open, adaptive loop system in an unpredictable environment). He suggested that in order to survive in the Information Age of today's market, adaptiveness, or outward focus, must take precedence over the traditional focus on efficiency, or inward focus, as a business strategy. His suggestion called for a reconfiguration in organizational design and strategy, including the adoption of new concepts and tools. Albeit in a peripheral manner, Haeckel acknowledged that organizational design is not the sole requirement for organizational adaptation; *people* must possess the ability or have learned the skill to adapt in unpredictable situations. His assertion implies that there are individual differences that may relate to how well people adapt to changing situations, with certain individuals performing better than others. Haeckel acknowledged that individual level adaptability is vital for organizational adaptation. However, outside of prescribing desired leadership competencies and an adaptive decision process to superimpose on decision makers, no mention was made as to what adaptive performance is at this individual level, or how to predict or select and train for adaptive performance. Thus, the research question left unanswered is how to enhance adaptive performance at the individual level.

Haeckel's (1999) organizational level perspective supplied a fitting organizational design and strategy for a turbulent work environment that demands adaptation. However, a commensurate individual level understanding of how to enhance performance in such an environment must be developed. Chan (2001) advised that researchers need to identify the individual differences that relate to adaptive performance and select for them. Zaccaro and Banks (2004) commented on the need to implement training programs that bolster skills related to adaptive performance.

Information Technology

In agreement with Haeckel's (1999) call for 'new tools' (i.e., technology), Vicente (1999) addressed the issue of adaptability from the perspective of IT design, creating technology to support an adaptive workforce. Vicente stressed the importance of using cognitive work analysis (CWA) in the design of computer-based information systems to aid workers in their adaptive role. CWA offers a systematic approach for uncovering the requirements and constraints of a system. The technology can then be designed to be flexible within the identified constraints, thereby providing the 'adaptive problem solvers,' operating on the frontline, with the flexible IT support they need to meet novel demands. In other words, within constraints, workers will be able to tailor the design of their device to meet the changing needs of their work.

Vicente (1999) described an example of such flexible technology. In a field study conducted with colleagues, Vicente found that operators in the control room of a nuclear power plant would change the set points on alarms to meet the needs of the current situation. For instance, there is an allowable value range, ± X, for a given tank under normal conditions. An alarm will sound if the level of the tank falls outside of ± X,

which has been prespecified by the system designers. However, it was noted that operators would adjust the alarm set points outside of the predefined range in order to meet the demands of the situation (e.g., when the tank needs to be emptied). By altering the alarm set points, the operators were able to alleviate observational monitoring requirements, using these resources elsewhere, and simply empty the tank when the alarm sounded. Thus, the workers recognized the flexibility inherent in the technology and displayed adaptive behavior by adjusting the alarm set points to better meet the demands imposed on them. If designers prevented the alarm set points from being adjusted outside of the predefined range, operators would be confined to observational monitoring. Vicente's example illustrates the importance of designing flexible technology to support adaptive workers.

An assumption in Vicente's (1999) approach to enhancing adaptability is that the current workforce has the ability or skill for adaptive performance. That is, they are postulated to have the requisite knowledge, skills, and abilities (KSAs) and have been selected and trained to perform in dynamic environments, but from Vicente's view, they are constrained by improper IT design. Haeckel (1999) and Vicente (1999) provide important pieces of the puzzle, adaptive organizational design and adaptive IT design. However, adaptive performance at the individual level will provide the foundational piece that will bridge both approaches and achieve optimal effectiveness in the adaptive performance of the entire system – the combined organizational, social, psychological, and technological components.

A caveat regarding the IT approach is that the implementation of the technology itself is often a source imposing change and requiring adaptation by the workforce

(Patrickson, 1986; Thach & Woodman, 1994). In other words, although IT may be part of the solution, it may also be part of the problem. A dominant change in the nature of work today has been the incredible influx of technology resulting in an environment best characterized as a complex sociotechnical system with inseparable social and technology components. Virtually all workers come in contact with technology in some manner. As technology becomes a mainstay in the workplace, individuals must adapt to, and evolve with technology and the changes in work it brings. Vicente (1999) stressed the importance of human adaptability in computer-based work and complex sociotechnical systems (CSS) in general. Because of the uncertainty inherent in CSS, Vicente noted that:

> Workers must exhibit context-conditioned variability–they must use their expertise and ingenuity to create a solution to counteract the disturbance in question. In complex sociotechnical systems, the primary value of having people in the system is precisely to play this adaptive role. Workers must adapt online in real time to disturbances that have not, or cannot be, foreseen by designers. As more and more routine tasks become automated, this requirement for worker adaptation will only increase. (p. 121)

The preceding quote emphasizes the adaptive role of the workers in general due to the nature of work today and also specifies that the increased automation of tasks (i.e., technology) will increase the requirement for worker adaptation. Thus, the increased

demand for adaptation or adaptive performance on the part of workers today is undeniable.

Vicente's (1999) foremost intention was to facilitate the design of technology in a manner that supports adaptive performance. However, the adaptive role of the 'human' is the integral aspect of the system. Haeckel (1999) made a similar assertion: "Although information technology plays an essential role in this process, human skill in recognizing patterns and thinking creatively about unanticipated challenges will continue to mark the difference between successful firms and unsuccessful ones" (p. 15). Thus, researchers such as Haeckel (1999) and Vicente (1999) have acknowledged the vital role human adaptive performance plays, but neither clearly defined adaptability at the individual level. Research is needed that examines adaptive performance in terms of a measurable performance construct at the human or individual level to understand the dynamic nature of adaptability from both social and technological sides.

In summary, the notion of adaptability has been addressed at higher levels of analysis and from differing perspectives. Although Haeckel (1999) and Vicente (1999) addressed adaptability from differing levels, it was clear that the integral part of an adaptive system is the unique human ability to respond creatively to new situations. Thus, individual-level research is crucial to fully articulate a coherent systems approach to understanding adaptability. Unfortunately, the concept has scarcely percolated down to the individual level in terms of systematic research.

Individual Level Adaptive Performance

The notion that individual employees must be flexible or adaptable with respect to various aspects of their work domain has long been acknowledged (Morrison, 1977).

Similar to the diverse cross-discipline approaches previously discussed, diverse approaches have been adopted to examine adaptive performance at the individual level. Reiterating Chan's (2001) definition, individual adaptability is the process by which individuals achieve a degree of fit between their behaviors and the demands created by novel and often ill-defined problems occurring in work situations. Guided by this definition, one can see how diverse approaches have been used to examine adaptation. Chan (2001) identified the essence of individual adaptation as generic. The cause of adaptive behavior, be it individual differences or training, is open to question. Given this ambiguity, researchers examining individual adaptability have proceeded under differing assumptions and conceptualizations. The following literature review is organized by one of the most prominent points of divergence in research conducted to date: the assumption of malleability, and in turn, the cause of adaptive behaviors.

Many researchers have developed their research programs based on an underlying assumption, explicit or implicit, about the malleability of adaptive behavior, viewing it as either a static ability or as an acquirable skill. Depending on the assumption adopted, research typically falls under one of two approaches: individual difference research or training research This demarcation is not always straight forward, but it is used here as a general categorization scheme to organize the literature presented herein.

As another point of clarification, findings from the team research literature are included in the review where they pertain to individual level influences on team adaptive performance. The emergent properties of team adaptive performance based on the coalescence of individual adaptive performance are admittedly neglected in the present study and deferred for future research. Interested readers are directed to the following

sources for research regarding team adaptive performance: Burke, Stagl, Salas, Pierce, and Kendall (2006); Chen et al. (2005); and Kozlowski and colleagues' research program (Kozlowski, 1998; Kozlowski, Brown, Weissbein, Cannon-Bowers, & Salas, 2000; Kozlowski, Gully, Brown, Salas, Smith, & Nason, 2001; Kozlowski, Gully, Nason, & Smith, 1999).

Individual Difference Research

With the individual difference approach, adaptability is viewed as a relatively stable aspect of the individual, and the research emphasis is on determining the relatively stable attributes and traits that characterize an adaptive individual or that serve to predict job performance in turbulent work environments. The ultimate goal of such research is to identify individuals that are most suitable for functioning in changing and uncertain work environments for selection purposes. There are several attributes and traits such as cognitive ability, cognitive style, and personality that potentially characterize an adaptive individual.

As far back as the 1970s, Morrison (1977) recognized the importance of adaptability in managers, as defined by the ability to adapt to changing managerial role demands. In this seminal work, Morrison found several significant predictors of role adaptation that indicated certain individuals are more adept at adapting to changing circumstances. These predictors included self-esteem, decision-making speed and simplicity, and openness to experience. In an examination of employee adjustment, Jones (1986) found self-efficacy to influence initial role orientations in that the lower individuals' self-efficacy the more likely they will adopt static role orientations. The higher individuals' self-efficacy, the more likely they will approach their job in an

innovative and flexible manner. Admittedly defining individual adaptation narrowly in her study of feedback seeking in uncertain situations, Ashford (1986) reported that individuals of longer job tenure and those with larger goal discrepancies between self and organizational expectations are less adaptable in their feedback seeking. Mumford, Baughman, Threlfall, Uhlman, and Costanza (1993) empirically examined more narrowly defined personality predictors of adaptive performance such as creative achievement, self-discipline, and lack of defense. Adaptive performance in Mumford and colleagues' research was defined and operationalized as task performance following a switch from a well-defined to an ill-defined task. Mumford and colleagues' results hinted at a personality profile indicative of individuals that are better at adapting to new and changing task demands. Thus, an individual that is disciplined, creative, and able to cope with the pressure of evaluative settings (lack of defense) should be more adaptable relative to individuals that do not possess these combined characteristics. Using a similar operationalization of adaptive performance, Reder and Schunn (1999) identified cognitive ability and inductive reasoning as predictors. LePine and colleagues' research program (LePine, Colquitt, & Erez, 2000; LePine, 2003; LePine, 2005) has also identified cognitive ability, as well as the personality factors of openness to experience, conscientiousness, and goal orientation as predictors of adaptive performance, again defined as performance on a novel task version.

Although the preceding research findings suggest several characteristics of an adaptive worker, and in turn, several predictors of adaptive performance, the definition and operationalization of the criterion lacked consensus across studies, limiting the possibility of generalizable relationships useful for the applied world (e.g., for selection

purposes). Asserting that openness is a predictor of adaptive performance may only hold true for adaptive performance narrowly defined as role adaptability (Jones, 1986; Morrison, 1977). Allworth and Hesketh (1999) were among the first to provide initial empirical evidence of a generalizable predictor-performance relationship and to critically examine the criterion being used (i.e., adaptive performance) in addition to its predictors. As opposed to examining performance on a novel version of a task, Allworth and Hesketh developed and validated a performance rating scale based on an extensive job analysis. The job analysis identified the task, contextual, and adaptive aspects of the job under examination.

The intent of Allworth and Hesketh's (1999) research was to distinguish adaptive performance as a unique performance dimension from the dimensions of task and contextual performance, identified by Borman and Motowidlo (1993). All three dimensions are conceptualized as broad, overarching dimensions of performance that are generalizable to most jobs. A necessary component of Allworth and Hesketh's research was to verify convergent and divergent predictors of adaptive performance in relation to the other two performance dimensions. They relied on individual difference variables as predictors. In support of a distinct performance construct, the results revealed unique individual difference predictors for the adaptive performance dimension. That is, above and beyond the variance accounted for by traditional predictors (i.e., cognitive ability and personality), Allworth and Hesketh found that biodata scales assessing experience with change and self-efficacy in regard to change were predictive of adaptive performance. As discussed in greater detail later, this initial research emerging from the individual

difference approach laid the foundation for the much needed construct clarification of adaptive performance.

Similarly, Pulakos and colleagues (2002) expanded on the notion of adaptive performance by examining the traditional job performance predictors of cognitive ability and personality, as well as predictors proposed to be unique to adaptive performance. Following Allworth and Hesketh's (1999) lead, they also developed a performance rating scale for the assessment of adaptive performance. To capture unique predictors of adaptive performance, they developed self-report measures that were variants on their adaptive performance rating scale. The measures assessed prior experience with adaptive performance, self-efficacy beliefs about adaptive performance capabilities, and interest in work settings that require adaptive performance. Pulakos and colleagues found support for relationships between each of the unique predictors and adaptive performance. However, prior experience with adaptive performance was the only unique predictor that accounted for incremental variance beyond that which was accounted for by cognitive ability and personality, the traditional predictors. Consistent with these results, Griffin and Hesketh (2003) found self-efficacy, prior experience (work requirements), and openness to experience to be significantly related to adaptive performance assessed via performance ratings.

Beyond focusing on individual difference variables, Griffin and Hesketh (2003) examined the influence of situational variables, namely job complexity and management support. These situational factors were significant predictors of adaptive performance in addition to individual difference factors. Confirming the influence of situational variables on adaptive performance, Zaccaro and Banks (2004) found management

support and organizational vision to be predictive of adaptive performance. In contrast to Griffin and Hesketh's assessment of adaptive performance via subjective ratings, Zaccaro and Banks' assessment of adaptive performance was based on objective task performance scores on a novel task version.

In summary, differing conceptualizations, measurement methods, and predictors of adaptive performance have been presented under the individual difference approach. Much of the initial research on adaptive performance construed the construct narrowly (e.g., Morrison, 1977). More recently, adaptive performance has been defined in broader terms and identified as a validated aspect of job performance (e.g., Allworth & Hesketh, 1999). The predominate measurement methods used to assess adaptive performance as an outcome are subjective performance rating scales and objective task scores on more difficult task versions. Regardless of the outcome measure used, cognitive ability and personality traits such as openness to experience have consistently been related to adaptive performance. Beyond cognitive ability and personality, situational variables and unique predictors of adaptive performance have been identified (e.g., Griffin & Hesketh, 2003; Pulakos et al., 2002; Zaccaro & Banks, 2004). Specifically, job complexity, management support, organizational vision, self-efficacy beliefs, interest, and prior experience in adaptive performance settings are predictive of adaptive performance. However, the majority of these predictors have only been examined using subjective performance ratings as the outcome measure.

Training Research

The acknowledgement of situational influences on adaptive performance (Griffin & Hesketh, 2003; Zaccaro & Banks, 2004) implies that individual adaptability has

malleable aspects. That is, if situational factors such as management support can alter individuals' adaptive behavior, then individuals could potentially learn to be adaptable given proper training. Thus, under the training approach to individual adaptation, the concern is with identifying the malleable knowledge, skills, and other characteristics, such as flexible knowledge structures, metacognitive or self-regulation skills, that are beneficial for operating in or adapting to unpredictable and changing work environments. In this domain, adaptability is largely viewed as a developmental process (Kozlowski et al., 2005)

Much of the training research on adaptability is analogous to the research on transfer of training. As defined by Baldwin and Ford (1988), transfer of training is the degree to which trainees effectively apply the knowledge, skills, and attitudes gained in a training context to the job. Baldwin and Ford identified two distinguishable aspects of transfer: maintenance and generalization. Traditional research on transfer has focused on the reproduction or maintenance of knowledge and skills across environments, which is the direct replication of training content to a static problem domain on the job. More recently, researchers have recognized the need for adaptation and generalization of knowledge and skills to novel and more complex situations (Baldwin & Ford, 1988; Kozlowski et al., 2001). The increased attention to the generalization component of transfer is due to the changing nature of work, where present-day trainees must be prepared to face novel and uncertain work situations. Smith, Ford, and Kozlowski (1997) noted that a change in training theory and research is needed due to the increasing dynamic nature of work. This evolution in work has placed a premium on the ability to generalize knowledge and skills, adapting them to new situations and problems. Thus,

the research on adaptability that adheres to the training paradigm is easily construed as an extension of the transfer of training research, with an explicit focus on transfer generalization.

A stream of work generated by Kozlowski and colleagues exemplifies the transfer generalization-adaptability association best. As argued by Kozlowski (1998) and Kozlowski et al. (1999), a reconceptualization of training systems is needed to achieve transfer (i.e., generalization and adaptability) of knowledge and skills in dynamic and changing work contexts. Traditional models of training focus on well-practiced and error-free performance, verging on automaticity, where learning is assessed via achievement tests during or immediately following training, and transfer is assumed if the knowledge and skills are displayed on the job (Kraiger, Ford, & Salas, 1993). The emphasis is on maximization of achievement performance during training and replication of knowledge and skills across contexts (i.e., training to job context). However, Schmidt and Bjork (1992) found that such training paradigms can hinder the development of deeper skills necessary for appropriate generalization and adaptability. That is, although trainees may perform well during training, they may have difficulty adapting under realistic or challenging task situations. Kozlowski (1998) stated that "effective transfer requires more than the reproduction of declarative knowledge and salient performance skills…it requires a foundation of knowledge and learning outcomes provided by training that can aid generalization, adaptability, and continued learning for a wide range of situations that can occur in the performance setting" (p. 120).

More specifically, Kozlowski and colleagues (1999) stated that we must develop training strategies that enhance adaptive performance. Supporting 'active learning'

during training is one such strategy (Kozlowski, 1998; Kozlowski et al., 1999; Smith, Ford, & Kozlowski, 1997). Active learning can encompass numerous training techniques such as advance organizers, analogies, guided discovery, error-based training, metacognitive instruction, learner control, and self-sequenced mastery goals (see Quinones & Ehrenstein, 1997, for technique descriptions). These training techniques serve to enhance transfer generalization to novel job settings or situations. The techniques also enhance adaptive performance on the job due to the facilitation of various learning outcomes such as deep comprehension, flexible knowledge structures, self-efficacy, self-regulatory and metacognitive skills, to name a few. Beyond the traditional emphasis on training content, including declarative and procedural knowledge as learning outcomes, more attention is given to deep comprehension and process learning outcomes, such as self-regulation, that augment the training content and aid transfer to novel and complex tasks (Gist, Bavetta, & Stevens, 1990). In addition to understanding the 'what' and 'how' of declarative and procedural knowledge, respectively, trainees must develop deep comprehension by understanding 'when' and 'why' particular procedures are appropriate as well as when they are not. Deep comprehension entails recognition of shifts in the situation that require adaptability and modification of strategies and actions to meet changing task situations (Kozlowski et al., 1999). Moreover, trainees must posses or develop effective motivational (e.g., self-efficacy) and affective (e.g., more positive and less negative affect; Schneider, 2004) attributes for persisting in such challenging work environments.

Within the training literature, much of the deeper knowledge and skill development facilitative of adaptive performance is captured under the rubric of

'adaptive expertise' (see Smith et al., 1997, for complete discussion on adaptive expertise). On the other hand, the majority of research initiated to examine adaptive performance, as we have defined herein, has focused on the development of process factors and motivational attributes. Thus, it is important to clarify the distinction between *adaptive expertise* and *adaptive performance*. Although adaptive expertise can lead to adaptive performance, adaptive performance does not require adaptive expertise. Adaptive expertise is based on a deep comprehension of a complex problem domain resulting in a flexible knowledge structure (Kozlowski, 1998; Smith et al., 1997). Although likely beneficial, such deep comprehension may not be a necessary prerequisite for adaptive performance. For example, depending on the simplicity of the problem domain, a high level of cognitive ability and/or openness to experience may be all that is required to achieve adaptive performance. Therefore, the specific topic of adaptive expertise is deferred, and the present research is focused on the training literature that addresses adaptive performance as a general construct.

The construct of self-efficacy has been examined under both the individual difference and the training research. Under the training approach, the emphasis has been on designing training programs to enhance self-efficacy. For example, Kozlowski and colleagues (2001) suggested the use of mastery goals during training to facilitate self-efficacy. When differentiating between maintenance and generalization, self-efficacy predicts transfer generalization operationalized as adapting performance from a simple to a more difficult task version (Gist & Mitchell, 1992; Kozlowski et al., 2001). Self-efficacy is particularly relevant to generalization and adaptive performance as it facilitates the embodiment of the competence and personal resiliency needed to

generalize skills in order to meet the novel demands faced in complex and changing transfer situations (Bandura, 1991; Gist & Mitchell, 1992; Kozlowski, 1998; Kozlowski et al., 2001). Individuals must first have confidence in their ability to adapt before they can perform adaptively. In the absence of this confidence, individuals will be more rigid and less willing to modify their behavior to fit the novel situation (Griffin & Hesketh, 2003; Kozlowski et al., 2001). As self-efficacy is not considered a generalized trait (Bandura, 1991), this confidence can be developed through training, or it can result from exposure to previous successful experiences in dealing with change, such as in a past job. Clearly, the latter view of self-efficacy development is consistent with the individual difference approach.

In addition to self-efficacy, Gist and colleagues (1990) suggested that transfer to a complex task (i.e., adaptive performance) depends on the trainee's capacity to orchestrate the generalization of knowledge and skills from the training context to the transfer task. Gist and colleagues further suggested that this orchestration is a function of: (a) trait-oriented cognitive abilities, as emphasized in the individual difference approach, enabling the integration of training material in a manner that facilitates its application in a novel context; and (b) the ability to manage affective factors, such as anxiety, that inhibit performance. Gist and colleagues provided empirical evidence indicating that augmenting content approaches to skill training with process approaches, which might include self-management training, facilitates this complex orchestration process.

Process approaches used during training focus more on instruction regarding how to generalize learning to novel tasks and contexts, for example, by promoting self-directed behavior, and less on methods of instruction in learning training content (Gist et

al., 1990). It is this augmented, process approach instruction that directly serves to enhance adaptive performance in the transfer context. Beyond traditional training outcomes, such as knowledge, skills, and affective outcomes (Kraiger, Ford, & Salas, 1993), trainees must be provided training on regulation processes that aid in generalization and adaptive performance in complex, dynamic work environments. Chen, Thomas, & Wallace (2005) asserted that post-training regulation processes, particularly metacognition and self-management, serve as the mechanisms linking training outcomes to adaptive performance.

In summary, the training approach has been more consistent in the conceptualization and measurement of adaptive performance relative to the individual difference approach. This consistency is likely due to the foundation provided by the transfer training and adaptive expertise literature. However, this consistency offers false assurance. For example, operationalizing adaptive performance as objective task performance scores based on novel and more complicated versions of tasks tells us nothing about what adaptive performance is. In terms of predictors of adaptive performance, the training approach has diverged greatly from the individual difference approach. Outside of self-efficacy and affective factors, of which personality plays a role (Gist et al., 1990), the emphasis is placed on developing deep comprehension and various self-regulatory skills (Kozlowski et al., 1998; 1999; 2000; 2001).

A Unified Approach: Individual Differences and Training

Adopting an input-process-output framework (IPO) unifies the individual difference and training approaches. Table 1 shows, working in reverse with adaptive performance as the ultimate outcome, posttraining regulation processes (e.g.,

Table 1

Summary of Literature and Research Findings on Adaptive Performance

	Individual Differences	⇨	Training Outcomes	⇨	Regulation Processes	⇨	Adaptive Performance
			Individual Difference Approach				
Morrison (1977)	- Self-esteem - Decision speed/simplicity - Openness to experience						- Role adaptation on the job
Jones (1986)	- Self-efficacy						- Role adaptation on the job
Ashford (1986)	- Goal discrepancy - Job tenure						- Adaptation through feedback seeking behavior
Mumford et al. (1993)	- Personality predictors (e.g., creative achievement, lack of defense)						- Performance on novel/complex task version
Reder & Schunn, (1999)	- Cognitive ability - Inductive reasoning as cognitive sub skill						- Performance on novel/complex task version
Allworth & Hesketh (1999)	- Cognitive ability - Personality - Change exp. - Self-efficacy						- Supervisor ratings of adaptive performance
LePine et al. (2000); LePine (2003; 2005)	- Cognitive ability - Openness - Conscientiousness - Goal orientation				- Team communication process variables		- Performance on novel/complex task version
Pulakos et al. (2002)	- Cognitive ability - Personality predictors - Change experience - Self-efficacy - Interest						- Supervisor ratings of adaptive performance based on Pulakos' taxonomy
Griffin & Hesketh (2003) *(also under situational factors)*	- Personality predictors - Self-efficacy - Change experience						- Supervisor and self ratings of adaptive performance based on Pulakos' taxonomy

Table 1 (continued).

	Individual Differences	⇨	Training Outcomes	⇨	Regulation Processes	⇨	Adaptive Performance
			Training Approach				
Gist et al. (1990)			- Negotiation knowledge and skill		- Self-management		- Performance on novel/complex task version
Gist & Mitchell (1992)			- Self-efficacy				- Performance on novel/complex task version
Kozlowski et al. (1999)			- flexible knowledge structures - deep comprehension - self-efficacy		- metacognitive skills		- Not an empirical study
Kozlowski et al. (2001)			- Task knowledge structure - Self-efficacy				- Performance on novel/complex task version
Chen et al. (2005)			- Role knowledge - Efficacy beliefs - Skill		- metacognitive and self-management skills		
			Situational Factors				
Griffin & Hesketh (2003)	- Management support - Job complexity						- Supervisor and self ratings of adaptive performance based on Pulakos' taxonomy
Zaccaro & Banks (2004)	- Organizational vision - Management support						- Performance on novel/complex task version

metacognition, self-management) mediate training outcomes (e.g., knowledge, skills, affect training) as proximal inputs, and trainee characteristics (i.e., individual differences) serve as distal inputs. Extending this framework, it is likely that situational factors play a moderating role (Griffin & Hesketh, 2002; Zaccaro & Banks, 2004). Table 1 clarifies this framework by summarizing the above literature regarding predictors of adaptive performance.

Reviewing Table 1, four issues become apparent: (a) most research adheres to a single approach and its underlying assumptions of malleability; (b) there is limited empirical evidence on situational factors and the regulation processes that serve as mechanisms to adaptive performance; (c) a plethora of predictors of adaptive performance have been examined; and (d) definitions and operationalizations of adaptive performance differ with only a few studies based on a validated model of adaptive performance.

A split in measurement methods for adaptive performance is apparent, and this split is largely aligned with the research approach adopted. Although there is more variation in assessment under the individual difference approach, the majority of research in this domain assesses adaptive performance using subjective performance ratings. Under the training approach, adaptive performance is primarily assessed using objective task performance measures obtained on novel and more complicated versions of tasks. The divergence in assessment methods for adaptive performance is the primary obstacle to unifying research on individual adaptability. As such, this obstacle must be addressed prior to and in service of all other issues. Indeed, how can predictions of adaptive performance be accurately determined if there is no agreement on what constitutes

adaptive performance? Thus, the intent of the present research was to (a) make steps towards a shared understanding of adaptive performance and (b) examine predictors of adaptive performance under a unified framework that incorporates both the subjective and objective measures of adaptive performance.

Aligning Measures of Adaptive Performance

As a preliminary step, the present research examined the convergent validity of the two foremost measurement methods used to assess adaptive performance: subjective performance ratings and objective task performance scores. To interpret and unify the results presented in Table 1, and prior to examining our own predictor model for adaptive performance, it must be verified that the different measurement methods are assessing the same construct. If the same construct is being assessed, the subjective and objective measures of adaptive performance should be interchangeable, and the predictors of one criterion measure should be consistent with the other (Bommer, Johnson, Rich, Podsakoff, & Mackenzie, 1995). This assumption has yet to be examined. Given the equivocal findings reported in regard to predictors of adaptive performance (Pulakos, Dorsey, & White, 2006), examination of the convergent validity of adaptive performance measures may serve to align disparities in the literature. In other words, this examination will be the first to shed light on whether the equivocal findings are attributable to the 'how' (different measurement method) or the 'what' (different constructs).

The collection of subjective performance ratings should be based on a theoretically derived and validated model of performance. Therefore, the subjective performance ratings were based on Pulakos and colleagues' (2000) construct-validated model of adaptive performance, the evolution of which is reviewed in detail below.

Consistent with the training approach, objective task performance scores on a novel and more complicated version of a task were obtained.

A Construct-Validated Model of Adaptive Performance

Albeit limited, there is research (e.g., Griffin & Hesketh, 2003; Heasketh & Neal, 1999; Pulakos, Arad, Donovan, & Plamondon, 2000) that has identified adaptive performance as a theory-based performance construct and has offered empirically validated taxonomies. This research has largely been approached from an individual difference perspective. As is common with research directed at establishing models of job performance (Murphy, 1989), these researchers have based the assessment of adaptive performance on subjective performance ratings. Outside of such researchers, adaptive performance is often reduced to a vague notion, void of any construct validity (Pulakos et al., 2000). An agreed-upon definition of adaptive performance is desperately needed. Too many researchers operationalize adaptive performance based on amenability to their specific study. This increases the risk of poor generalizability and lack of convergence of results across studies.

As mentioned previously, Allworth and Hesketh (1999) were among the first to move beyond viewing adaptability as a vague notion and systematically address it as an important construct in the performance domain. Allworth and Hesketh's results were promising as the findings confirmed adaptive performance as a distinct dimension in the general performance domain. Although their results provided initial evidence of construct validity for adaptive performance, additional research was needed to refine the methodological and measurement issues surrounding adaptive performance. Moreover, as the adaptive performance construct is relatively new, continued research efforts are

needed to cement its validity and clarify its implications for organizations and the changing demands placed on workers today.

Adaptive job performance taxonomy. Researchers are beginning to recognize the potential of assessing adaptive performance, yet there is still a lack of consensus about what adaptive performance means across job, occupational, or role assessment situations. Under varying definitions and names for the concept, adaptability has been discussed in relation to different phenomena at the individual, team, and organizational levels. It has also been discussed in relation to numerous organizationally relevant variables such as new people and teams, novel and ill-defined problems, different cultures, and technology (Pulakos et al., 2000). In an endeavor to align future research efforts, Pulakos and colleagues (2000; 2002) provided a generalizable taxonomy of adaptive performance and a global measure for the assessment of adaptive performance on the job. Pulakos and colleagues began their research effort by conducting an extensive literature review to identify and extract key aspects of adaptive performance. The literature review revealed six relevant dimensions of adaptive performance: 1) solving problems creatively; 2) dealing with uncertain and unpredictable work situations; 3) learning work tasks, technologies, and procedures, 4) demonstrating interpersonal adaptability; 5) demonstrating cultural adaptability; and 6) demonstrating physically oriented adaptability.

Adopting the notion that performance should be defined in terms of behavior (Campbell, McCloy, Oppler, & Sager, 1993), Pulakos and colleagues (2000) gathered empirical evidence for the dimensions by content analyzing over 1,000 critical incidents from 21 different jobs within 11 different military, government, and private sector jobs.

A wide range of jobs were examined and included service jobs, technical jobs, law enforcement jobs, support jobs, supervisory and managerial jobs, and varying military jobs. The content analysis revealed two additional dimensions: 7) handling emergencies or crisis situations, and 8) handling work stress. This research provided the field with a generalizable definition of adaptive performance, defined as *altering behavior to meet the demands of the environment, an event, or a new situation*. Moreover, Pulakos and colleagues developed and validated a preliminary taxonomy (see Appendix A) serving as an 8-dimension model of Adaptive Job Performance (AJP), as well as a behaviorally-based measure to assess adaptive performance.

In establishing an AJP model, Pulakos and colleagues (2000) elucidated adaptive performance as an important aspect of job performance that has been neglected in previous models such as Borman and Motowidlo's (1993) and Campbell and colleagues' (1993) performance models. The development of the AJP model greatly contributed to work-related research as adaptive performance is likely to play a dominant role in numerous aspects of Industrial-Organizational Psychology. For example, areas such as performance assessment, selection, and training are likely to be affected by the increasing dependency organizations have on adaptive performance (Ilgen & Pulakos, 1999; Quinones & Ehrenstein, 1997).

Similar to Campbell and colleagues' (1993) performance model, the eight-dimension AJP model (Pulakos et al., 2000) is intended to reveal the latent structure of the performance construct at a general level of abstraction, thereby providing a common framework for research and applied uses. The taxonomy is not intended to exhaust all aspects of adaptive performance, but rather, capture the general dimensions of adaptive

performance. Furthermore, the applicability of each dimension will vary across jobs, with certain dimensions affording greater generalizability than other dimensions. For example, demonstrating interpersonal adaptability is an important aspect of numerous jobs, whereas handling crisis situations is not. While the AJP taxonomy provides a unifying framework for the various dimensions of adaptive performance, job specific analysis is required to identify the relevant AJP dimensions for the particular job or organization being considered (Pulakos et al., 2000). Adaptive performance is best construed as a multidimensional construct that requires identification of the situations or demands that require adaptation (Chan, 2001).

Figure 1 illustrates the hypothesized role adaptive performance plays in the criterion space of the job performance domain (i.e., all possible manifestations of job performance) and in relation to alternative models of job performance. As depicted, adaptive performance captures an area of job performance neglected by the other two models; specifically, Borman & Motowidlo's (1993) task and contextual model and Campbell et al.'s (1993) eight-factor model. However, all three models are within the general job performance domain, but each model captures differing performance dimensions of that domain.

Campbell and colleagues' (1993) research was derived from a large scale military study (Project A), which resulted in the most widely used performance model to date. The model is intended to capture the highest-order latent structure of job performance from a behaviorally-based perspective. The eight factors are: job-specific task proficiency, non-job-specific task proficiency, written and oral communication, demonstrating effort, maintaining personal discipline, facilitating peer and team

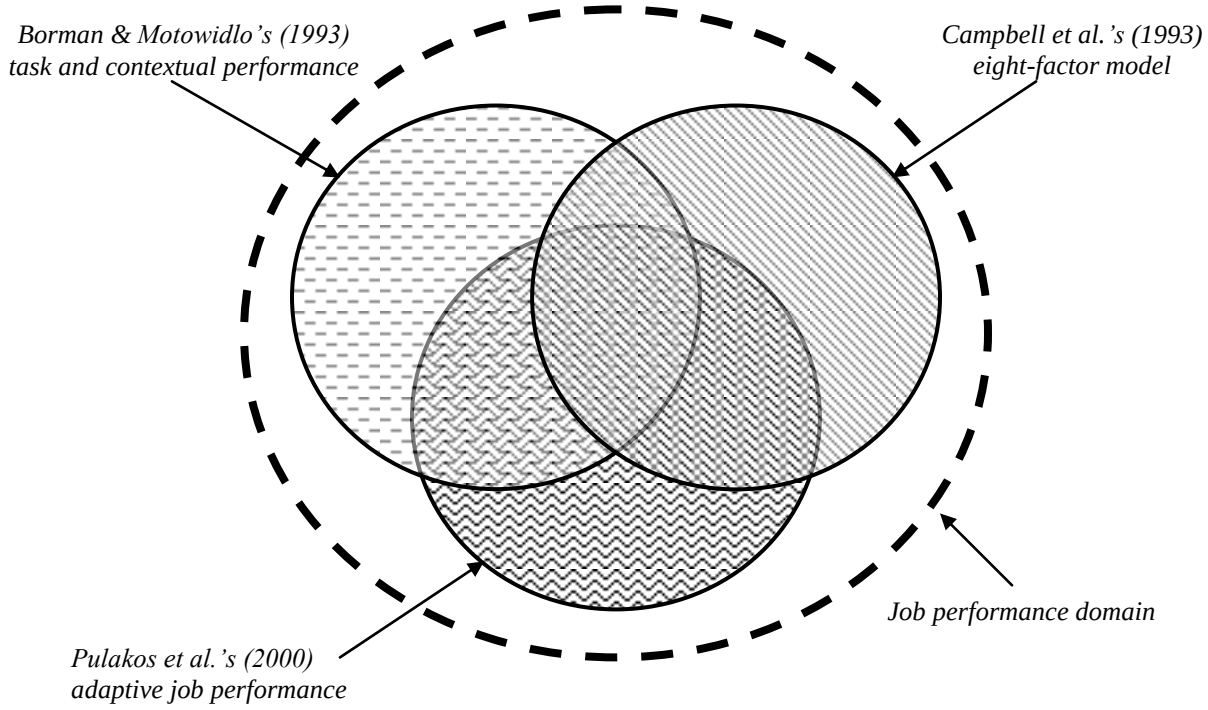

Figure 1. Amalgamated view of the leading job performance models.

performance, supervision, and management or administration. Campbell and colleagues' model was based on a content analysis approach and was intended to sufficiently describe all jobs in the *Dictionary of Occupational Titles.* Thus, the degree of applicability of each dimension will depend on the type of job being considered. Borman and Motowidlo's (1993) model, on the other hand, originated from a theoretically-based perspective and included a distinction between cognitive ability and personality as predictors. Borman and Motowidlo's model describes job performance as comprised of both task and contextual performance. Task performance aligns with Campbell and colleagues' dimensions in that it captures the predefined aspects of a job. Contextual performance is defined as behaviors that contribute to organizational goals but typically are not included in a job description. Examples of contextual performance include, "endorsing, supporting, and defending organizational objectives" and "volunteering to carry out task activities that are not a formal aspect of one's job." Although Campbell and colleagues include a 'non-job-specific' dimension, it refers more to the general, predefined or assumed requirements of all jobs in a particular organization or department.

Adaptive performance captures an area beyond Borman and Motowidlo's (1993) and Campbell and colleagues' (1993) models; namely, the ability to quickly alter behavior and transfer learning to meet the demands of the environment, new situation, and/or changing task demands. Moreover, the significance of adaptive performance is likely to increase for numerous present-day jobs. That is, the variance or area accounted for by adaptive job performance is likely to increase due to the changing nature of work (Borman & Motowidlo, 1993; Ilgen & Pulakos, 1999; Quinones & Ehrenstein, 1997; Weiss, 1991).

There are a few aspects that should be noted regarding Figure 1. The first is that no one model is correct or captures the entire criterion space of job performance. There will always be aspects of job performance that are overlooked or irrelevant to the particular job or organization under consideration. Job performance is an abstract concept, thus the specific manifestations of job performance will differ from job to job and organization to organization (Viswesvaran & Ones, 2000). The creation of the various job performance models are intended to capture these manifestations. For example, contextual performance would be of greater relevance in a service-oriented job compared to a production line job, which would be based more on task or technical performance. Thus, the specific model or models chosen should be based on the purpose of the study and/or the values and interests of the organization (Murphy & Shiarella, 1997).

Another important aspect of Figure 1 is the overlap of the performance models. The overlap depicts the shared aspects of the performance models. For example, Johnson (2001) suggested that the adaptive performance dimensions of handling emergencies or crisis situations, solving problems creatively, and physically oriented adaptability likely contain elements of Borman and Motowidlo's (1993) task performance, whereas the dimensions of demonstrating interpersonal adaptability and demonstrating cultural adaptability likely relate to Borman and Motowidlo's contextual performance. Although the dimensions may share common elements with other performance models, the adaptive performance dimensions are much broader and capture distinct aspects of performance (Johnson, 2001).

Although Pulakos and colleagues' (2000) model provided the field with a succinct, generalizable definition and taxonomy for identifying adaptive performance behaviors, Griffin and Hesketh asserted that a theoretical explanation for such behaviors was absent. This is not to say that the approach was misguided, as there are numerous approaches to the development of job performance models. Viswesvaran and Ones (2000) noted that two prevalent approaches include job analytic techniques, such as Campbell and colleagues' (1993) and Pulakos and colleagues' (2000), and a theory-based approach, such as Borman and Motowidlo's (1993). Often, several researchers use differing approaches for examining or explaining a similar concept, such as job performance. As a result, strength is often generated for the construct when models coalesce. Figure 1 illustrates the strength added to the assessment of the job performance construct by the increased coverage when three models are integrated. Recognizing the lack of a theoretical explanation for the behaviors related to adaptive performance in Pulakos and colleagues' AJP model, Griffin and Hesketh fit the Minnesota Theory of Work Adjustment (Dawis & Lofquist, 1984) to the AJP taxonomy.

Dawis and Lofquist (1984) developed the Minnesota Theory of Work Adjustment (TWA) to assist individuals in career choice and adjustment. The basic tenet of TWA is that work adjustment or adaptation is a continual and dynamic interaction between the individual and the work environment, with the goal of maximum fit between the two. In other words, the individual brings a certain set of knowledge, skills, needs, abilities, and values to the job. The work environment requires certain tasks to be performed that draw on a typical set of the aforementioned characteristics. Although the fit between the work environment and the individual's characteristics might initially be good, a change in the

work environment could serve to reduce the fit. If such a mismatch in fit occurs, the TWA asserts that the individual is likely to engage in a process that will restore a good fit. This process is composed of three possible styles of adjustment or adaptation: 1) activeness – change directed at the environment, 2) reactiveness – change directed at the self, and 3) flexibility – level of tolerance for the mismatch. Although the TWA was directed at career adjustment and developed at a time when work environments were relatively stable, Griffin and Hesketh (2003) recognized the theory's applicability to adaptive performance and adjustment within jobs.

Based on TWA's styles of adjustment, Griffin and Hesketh (2003) defined three broad types of adaptive behaviors: 1) proactive behaviors – actions that have a positive effect on the changed environment, 2) reactive behaviors – modifying oneself to better fit the new environment, and 3) tolerant behavior – continued functioning despite the changed environment. The latter may occur if proactive or reactive behaviors are not possible or do not restore good fit. Griffin and Hesketh went on to categorize the AJP taxonomy under the TWA framework, thereby providing a theoretical foundation for adaptive performance. Indeed, as categorized by Griffin and Hesketh, the dimensions of the AJP model (see Appendix A) fit nicely into the categories of *proactive* (handling emergencies or crisis situations, solving problems creatively), *reactive* (new learning, interpersonal, cultural, and physical adaptability), and *tolerant* (handling work stress, dealing with uncertain and unpredictable work situations).

Griffin and Hesketh (2003) did not find full support for their model. Factor analyses revealed support for a two-factor model of proactive and reactive behaviors, but the third factor of tolerance did not emerge. The failure of the tolerance factor to emerge

may have been due to limitations in the study, such as the tolerance factor not being applicable to the job or sample used. Alternatively, a two-factor model may simply be the appropriate, parsimonious factor structure for the construct. For instance, the proactive and reactive factors resemble Haeckel's (1999) assertion that a fully adaptive system requires humans that are able to adapt within a given context (*reactive*) as well as consciously adapt the context itself (*proactive*). Considering that Griffin and Hesketh were the first to test such an innovative model, the present research will utilize a similar three-factor adaptive performance model to verify whether the tolerance factor adds unique variance to the prediction of adaptive performance.

A Predictor Model for Adaptive Performance

Interpreting Previous Research Findings

It is clear from the preceding literature review that a plethora of predictors of adaptive performance have been examined. Unfortunately, due to the failure to work from an agreed upon theoretical framework for the construct of adaptive performance until recently, many of the research findings have been equivocal. Unless predictors are examined in conjunction with a theoretically based and empirically validated model of adaptive performance, we cannot be certain of what it is we are predicting. Moreover, interpreting the research findings reported above is difficult due to the diversity in approaches and criterion measures used.

There appear to be three general categories of predictors: cognitive, affective such as personality variables, and situational influences. General and specific cognitive abilities (Allworth & Hesketh, 1999; LePine et al., 2000; Pulakos, 2002) and personality factors (Griffin & Hesketh, 2003; LePine et al., 2000; Morrison, 1977; Mumford, 1993;

Pulakos et al., 2002) have been consistently related to adaptive performance. Although results have been equivocal, of the personality factors, openness to experience (Allworth & Hesketh, 1999; LePine et al., 2000; LePine, 2003; Griffin & Hesketh, 2003) and neuroticism (Allworth & Hesketh, 1999; Pulakos et al., 2002) appear to be the most consistently related to adaptive performance. Indeed, Allworth and Hesketh categorize openness and neuroticism as change-related personality factors. Conscientiousness has received marginal support (LePine, 2003). Beyond the traditional, global predictors of cognitive ability and personality factors, unique predictors of adaptive performance have been identified, including change-related self-efficacy and prior experience with adaptive situations (Allworth & Hesketh, 1999; Griffin & Hesketh, 2003; Pulakos et al., 2002). Finally, a few researchers (Griffin & Hesketh, 2003; Zaccaro & Banks, 2004) have explored the territory of situational influences, with findings indicating that job complexity, management support, and organizational vision influence adaptive performance.

Borman and Motowidlo (1993) assert that cognitive ability and personality differentially predict separate dimensions of task and contextual performance, respectively. A similar assertion seems plausible with the dimensions of adaptive performance. As Allworth and Hesketh (1999) alluded to, there is an evident cognitive component in the very definition of the dimension *learning new work tasks*, whereas there is a strong attitudinal or personality orientation to the dimension of *interpersonal adaptability*. Although the separate dimensions of the AJP model may have slightly more of a cognitive or more affective orientation, this distinction is likely not as straightforward as Borman and Motowidlo's (1993) distinction implies. That is, both

cognitive and affective components, to an extent, are likely necessary for a high level of adaptive performance under any of the eight dimensions. Considering Pulakos and colleagues' (2000) definition of adaptive performance, the cognitive component relates to the *application of learning and problem solving skills*, and the affective component relates to the attitudinal or emotional adjustment that is required to *cope with changing environments and task requirements*. Therefore, unlike Borman and Motowidlo who propose greater independence of cognitive-task performance and personality-contextual performance, it is likely that the cognitive and affective components are largely inseparable within adaptive performance. That is, a high level of adaptive performance requires an individual to be able to transfer knowledge and skills (cognitive) as well as cope emotionally (affective) with the increased demands and stress imposed by a dynamic and ever-changing work environment.

At first glance the distinction between cognitive and affective components to adaptive performance may appear to reflect the overlap (see Figure 1) with the task and contextual components of performance proposed by Borman and Motowidlo (1993). However, Allworth and Hesketh's (1999) research substantiates the distinctive nature of adaptive performance. That is, although adaptive performance likely overlaps with task and contextual performance, being adaptable within the boundaries of a dynamic job is a distinct aspect of performance relative to performing a static job at a high level. As such, there are likely distinct predictors of, or a distinct predictor model for adaptive performance. Although prior research has examined the possibility of distinct predictors of adaptive performance such as change-related self-efficacy, a distinct path model for the prediction of adaptive performance has yet to be specified.

Hypotheses

Replicating Previous Research

Although consistencies with predictors of adaptive performance have been identified, it is important to replicate these findings based on a solid criterion measure foundation. Consequently, this research proceeded in two parts. Part one examined the convergent validity of subjective and objective measures of adaptive performance, and the second part replicated previous research by examining predictors of adaptive performance that have received the most support: (a) the traditional predictors cognitive ability and personality and (b) self-efficacy specific to adaptive performance. The latter was posited to be predictive of adaptive performance above and beyond cognitive ability and personality.

H1: Cognitive ability, openness to experience, conscientiousness, extraversion, and emotional stability (neuroticism reversed) was expected to be positively related to adaptive performance.

H2: Self-efficacy was expected to be positively related to adaptive performance and predictive of adaptive performance beyond that of cognitive ability and personality.

Extending Previous Research

The present research also aimed to extend previous research on adaptive performance in the following areas: (a) examine task requirements as a situational influence on adaptive performance, (b) examine stress appraisals as a predictor of adaptive performance, (c) examine the factor structure of both the predictor set and

adaptive performance, and (d) examine an indirect relationship between predictors and adaptive performance operating through self-efficacy.

Situational Influences

The research examining predictors of adaptive performance is equivocal and limited, especially in terms of situational predictors. Griffin and Hesketh (2003) are the only researchers to date that have examined situational predictors (e.g., job complexity) of adaptive performance. The acknowledgement of a person's environment as a determinant of behavior can be dated as far back as Lewin's (1951) formulation of behavior as a function of person and his or her environment. Holding strong today, this notion is echoed in the rhetoric of the 'systems' view. As behavior does not occur in a vacuum and acknowledging that individuals are inextricable from their environment, it is imperative that any researcher intent on examining human behavior should attempt to incorporate situational influences in their research program. Stemming from Griffin and Hesketh's support for job complexity and work requirements, the present study examined the influence of situational or task requirements.

Task requirements. Griffin and Hesketh (2003) found job complexity, assessed as a situational variable, and work requirements to be positively related to adaptive performance. This positive relationship is logical under the framework provided by the Theory of Work Adjustment (TWA) described previously. TWA posits that a good fit between an individual's skills and abilities, for example, and the requirements of the work environment result in better performance (Dawis & Lofquist, 1984). Thus, increased job complexity and similar work requirements 'fit' the skills and abilities of an adaptive person, thereby eliciting adaptive behavior. Such individuals are challenged by

the increased complexity and demanding nature of these environments (Griffin & Hesketh, 2003).

H3: Task requirements were expected to moderate the relationship between individual adaptive characteristics (i.e., self-efficacy) and adaptive performance, such that a stronger, positive relationship was expected in a condition of increased task complexity.

Stress Appraisals

As opposed to viewing the notion of 'fit' as determined solely by an observer, individuals themselves evaluate whether or not they believe their skills and abilities are commensurate with the requirements of the situation. Such evaluations are referred to as stress appraisals (Lazarus & Folkman, 1984). Stress appraisals are comprised of two evaluative components: primary and secondary. Primary appraisals evaluate the personal relevance of a situation in terms of the potential threat it presents in relation to the individual's goals, values, and beliefs. Secondary appraisals evaluate one's resources for responding to the demands of the situation. The primary and secondary evaluative components combine to result in a continuum of appraisal outcomes where individuals range from being challenged to threatened (Blascovich & Mendes, 2000). Threat appraisals occur when individuals believe their resources, such as skills and abilities, are disproportionate to the demands of the situation. Challenge appraisals occur when individuals construe their resources as proportionate to or exceeding situational demands. Threat and challenge appraisals have been found to differentially affect performance, affective outcomes, and physiological responses (Gildea, Schneider, & Shebilske, 2007; Schneider, 2004; Tomaka, Blascovich, Kelsey, & Leitten, 1993).

Adaptive individuals will likely appraise highly demanding and complex situations as a challenge, whereas non-adaptive individuals will appraise the situation as a threat. In accord with the notion of person-environment fit presented under the TWA framework, adaptive individuals will have the appropriate abilities and other characteristics needed to respond to a complex situation. For example, adaptive individuals tend to be low in need for structure, embracing the uncertainty and spontaneous nature of changing situations (Svennson et al., 2005), and they are typically of higher cognitive ability. This low need for structure decreases the potential threat of adaptive situations (primary appraisal), and the higher cognitive ability serves as a coping resource (secondary appraisal). Thus, such individuals may appraise adaptive situations as a challenge, resulting in higher adaptive performance.

H4: Stress appraisals, where high scores indicate threat appraisals and low scores indicate challenge appraisals, were expected to be negatively related to adaptive performance.

Factor Structure

Preliminary results based on the work of a NATO research team attempting to identify a profile indicative of an adaptive worker have revealed a possible three-factor structure for various indicators of adaptive performance (Svensson, Lindoff, Anderson, Norlander, & Sutton, 2005). Although an adaptive performance scale such as Pulakos et al.'s (2000) was not used as a criterion measure in the study, the data collection sites were intentionally chosen for their high degree of adaptive performance inherent in the job duties. Svenson et al.'s intent was not to predict adaptive performance as a distinct dimension of performance, but to identify latent factors denoting an adaptive worker

profile that would aid in overall performance. Clearly, such profile information would be useful for selection purposes. Thus, the present research effort supplemented Svensson et al.'s research by incorporating a criterion measure of adaptive performance in an effort to examine the predictive validity of the identified adaptive profile.

Due to the enormity of Svensson et al.'s (2005) research effort, numerous indicators of adaptability were examined, including various personality and cognitively-oriented variables. Following the use of data reduction and modeling efforts, preliminary results denoted that the majority of the indicators loaded on one of three factors. These factors were labeled: 1) Instability, 2) Adaptability, and 3) Need for Structure. *Instability* was composed of Fear of Invalidity and Neuroticism. *Adaptability* was composed of Emotion Regulation and Cultural Adjustment. *Need for Structure* was composed of Personal Need for Structure and Need for Cognitive Structure. Each indicator is explained in detail below.

Note that the term "adaptability" has been designated as a predictor in the NATO research efforts. This designation raises a need for clarification as there may be some confusion regarding whether adaptability is a predictor or an outcome. Wheaton and Whetzel (1997) stated that various measurement instruments can be categorized as a "predictor" or as a "performance measure" depending on the researcher's intention and design of the study. For example, the performance scores at the end of a training program can be used as an *outcome* measure of training or as a *predictor* of transfer performance on the job. Although such an exchange is permissible, in the present research adaptability as a predictor and adaptive performance as an outcome are operationalized as two separate constructs, each with their own measurement scales.

Thus, “adaptability” was assessed as a predictor measured by emotion regulation and cultural adjustment, and “adaptive performance” was assessed as an outcome measured by the Pulakos et al. (2000) scale.

H5: Instability and Need for Structure were expected to be negatively related to adaptive performance, and Adaptability was expected to be positively related to adaptive performance.

Self-Efficacy Mediation

As opposed to the direct relationships hypothesized in previous research in regard to predictors of adaptive performance, the present research hypothesized a partially mediated relationship operating through self-efficacy (see Figure 2). Generally speaking, research has indicated that self-efficacy often serves as a proximal predictor of performance while other individual attributes and situational influences tend to be distal, or antecedent to self-efficacy (Gist & Mitchell, 1992; Mathieu, Martineau, & Tannenbaum, 1993). Considering this research in combination with the consistent relationship of self-efficacy with adaptive performance reported above, the examination of a mediated relationship is warranted. If the proposed mediated relationship is found, it may serve to clarify some of the equivocal results in the field regarding the prediction of adaptive performance.

H6: Self-efficacy will partially mediate the influence of all other individual difference variables on adaptive performance.

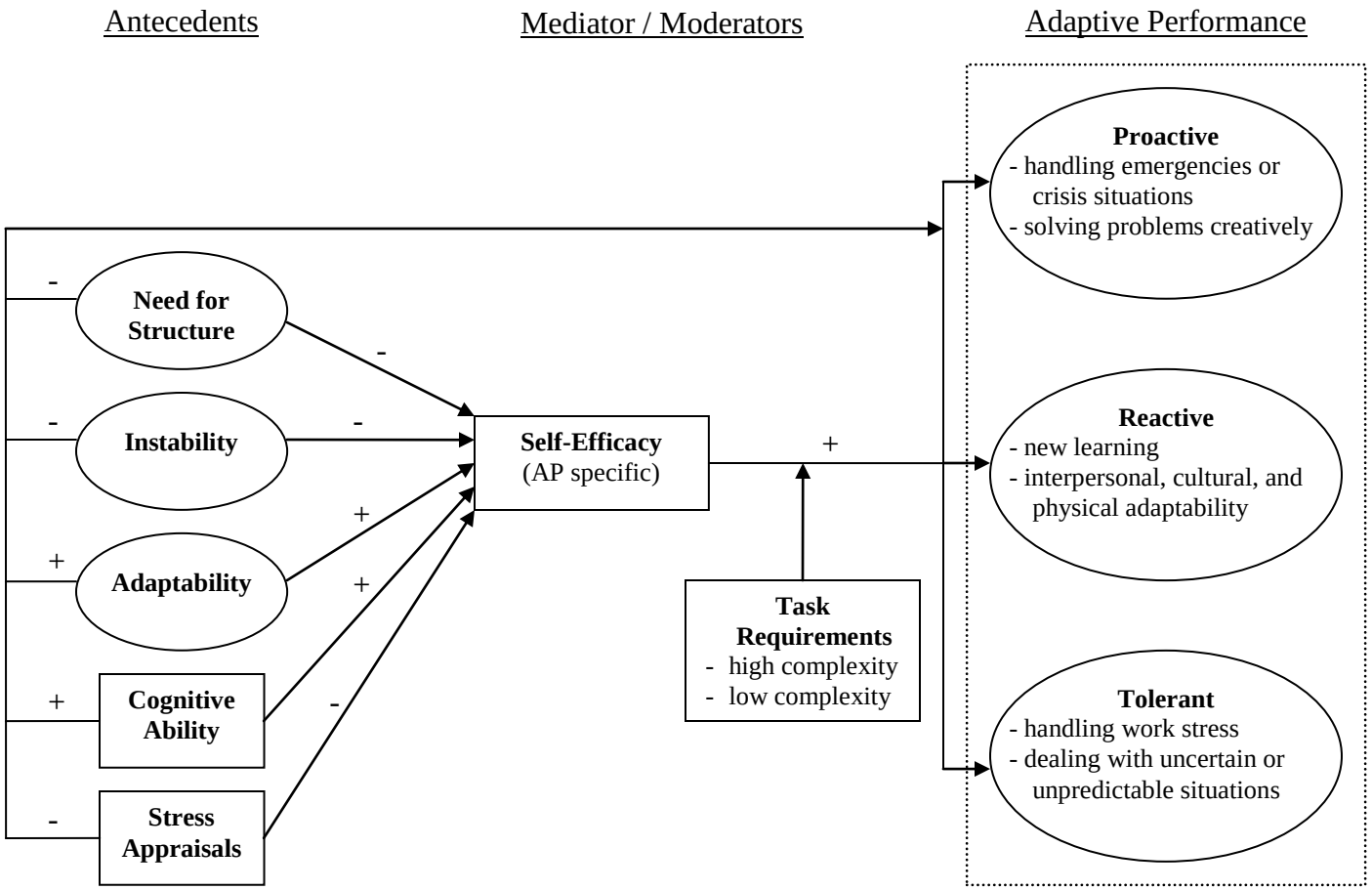

Figure 2. Conceptual predictor model for adaptive performance.

Summary

In an effort to clarify the prediction of adaptive performance, the present research (a) examined the convergent validity of adaptive performance measures in part one, and (b) in part two, examined the aforementioned hypotheses in a predictor model of adaptive performance that supplemented objective task performance scores with subjective performance ratings that have been theoretically defined and empirically validated (Griffin & Hesketh, 2003; Pulakos et al., 2000). Such an approach increases the generalizability and *applied* value of the findings.

II. METHOD

Participants

A total of 275 people (41% male) from a midwestern university population volunteered to participate in the study in exchange for course credit (200 subjects) or for monetary remuneration (75 subjects) in the amount of $30. The sample was culturally diverse with 64% Caucasian, 16% African American, 17% international students primarily from India, and 3% of other nationalities. The age distribution of the sample ranged from 18 to 49 (mean = 20). Due to computer malfunctions and other issues, data involving objective adaptive performance were only available for 150 participants.

Power Analysis

Sample size. Kline (1998) provided general guidelines for sample sizes when using Structural Equation Modeling (SEM): small $N < 100$, medium N 100 - 200, and large $N > 200$. However, the complexity of the model being examined is a better indicator of the sample size required for uncovering statistically significant results. The number of parameters to be estimated in the model dictates its complexity. Following Byrne's (2001) estimation procedure, the proposed model contains 24 parameters to be estimated: 9 regression coefficients, 13 variances, and 2 covariances (see Figure 3). Kline (1998) suggested that a ratio of 10:1 (participants to parameters) is suitable to achieve sufficient statistical power. Thus, the targeted sample size for the present study was a minimum of 240 participants. Although the larger sample size targeted was not

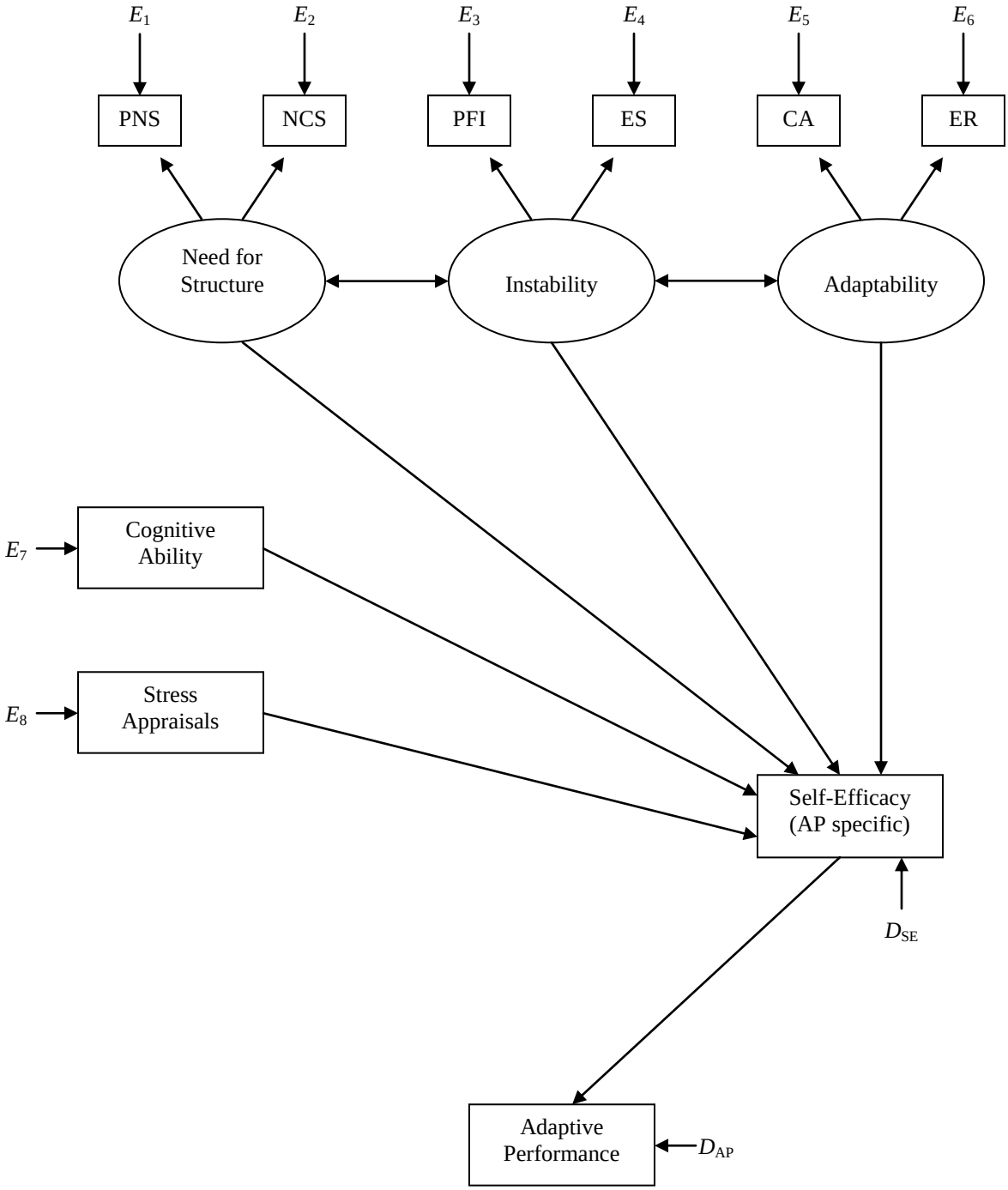

Figure 3. Proposed structural equation model to be tested. PNS = Personal Need for Structure, NCS = Need for Cognitive Structure, PFI = Personal Fear of Invalidity, ES = Emotional Stability, CA = Cultural Adjustment, ER = Emotion Regulation

achieved due to the data loss associated with computer malfunctions, the sample analyzed exceeded the minimum requirement of 100 (Kline, 1998).

Model identification. When using SEM, there is an additional concern with statistical significance beyond sample size. The identification of the structural path model must be established to determine if the model will be scientifically useful (Bryne, 2001). Identification is based on the comparison of parameters to the sum of the variances and covariances of the observed variables (i.e., data points). Structural path models can be classified as (a) just-identified, (b) underidentified, or (c) overidentified. A just-identified model has zero degrees of freedom, as the number of parameters equals the number of data points, therefore rendering rejection of the model impossible. The opposite holds for an underidentified model as an infinite set of solutions are possible. Because the parameters of an underidentified model exceed the available data points, there is insufficient information to determine parameter estimations (Byrne, 2001). An overidentified model has fewer estimable parameters relative to data points. An overidentified model is the goal in SEM as it results in positive degrees of freedom and the possibility of model rejection. The model in the present study is classified as overidentified. Calculating the number of data points, $p(p + 1)/2$, where p = the number of observed variables, there are $10(10 +1)/2 = 55$ data points in the proposed model. With 55 data points and 24 parameters, the proposed model is overidentified with 31 degrees of freedom.

Task Apparatus

A team-based laboratory task, Computer-based Aerial Port Simulation (CAPS), developed by AFRL/RHAL was used as the research platform (Lyons, Stokes, Palumbo,

Seyba, & Ames, 2006). The hardware included five networked PCs that participants used to perform the task, and a sixth PC served as the experimenter station for data upload and scenario manipulation. The CAPS software is a computer-generated, five-player simulation program of the logistics operations associated with an aerial port squadron. A team was composed of five interdependent functional stations: (a) passenger services, (b) fleet services, (c) cargo services, (d) ramp services, and (d) air terminal operations flight (ATOF). Passenger services must process, load, and unload all passengers. Fleet services must clean the aircraft and stock the aircraft with meals and other comfort items. Cargo services must process in-bound and out-bound cargo, which includes sequencing palletized cargo for pick-up by ramp services. Ramp services unloads and transports in-bound palletized cargo in the cargo bay and loads out-bound cargo to the aircraft. The ATOF monitors and directs the sequencing of all activities in the aerial port, essentially serving as the hub through which all information regarding aircrafts is received, processed, and dispatched to the other four functional stations.

The stations are interdependent, for example, fleet services cannot clean the aircraft until passenger services has unloaded all passengers. Similarly, cargo services cannot process in-bound cargo until ramp services transports and unloads the cargo. Thus, participants must coordinate and communicate their individual activities to achieve the shared goal of preparing aircraft for takeoff in sufficient time. Due to the high degree of communication required to complete this task, a vital component of the CAPS software is the instant message (IM) system. Participants are able to communicate needed information to other team members individually or globally (see screen display, Appendix B).

CAPS incorporates a training phase which consists of general and specific training as well as a practice session. The training phase will be described more fully in the procedure. Following training, the experimenter generated two 30-minute task sessions. The first session included five aircraft with no disturbances, which was consistent with the training session. The second session was more complex involving the repurposing of aircraft as well as a communication breakdown, which required adaptive responses from the participants. Specifically, for the third aircraft, an IM was sent to all team members that stated there had been a destination change and all passengers and cargo must be repurposed. That is, the passengers and cargo already loaded onto the aircraft had to be taken off the aircraft and new passengers and cargo for the revised destination had to be loaded. Further complicating matters, a communication breakdown in the IM system occurred 2 minutes into the repurposing event. With certain communication links down, participants had to reroute information through previously unused nodes. For example, with the communication link between cargo and ramp services down, the two team members had to convey needed information through third and fourth parties, specifically fleet and passenger services. However, participants were not informed of this option. Rather, they had to discover, or adapt to, the situation on their own.

Adaptive performance requirements. CAPS served as an excellent tool to assess adaptive performance as three aspects emphasize adaptability: 1) the repurposing of aircraft, 2) the communication breakdown, and 3) the interdependency of the task. Manipulation checks were created for the present study to ensure the adaptability requirements of the task were perceptible to the participants. The scale was administered

twice; once immediately following the end of each task session. Based on a response scale ranging from 1 ‘not at all’ to 5 ‘extremely’, two items assessed perceived adaptability requirements: 1) In your opinion, how difficult was this task? 2) To what degree do you feel you had to adjust or adapt your behavior to cope with the task demands? And two items assessed perceived task interdependence: 3) To what degree do you feel your performance on this task was dependent on the performance of your teammates? 4) To what degree do you think your teammates’ performance would have suffered if you did not perform your job?

Performance

As with the overall logistics domain, the teams operating in this experimental domain are best viewed as an adaptive network where individual roles (nodes) and the links between them can be reconfigured or adapted to meet changing task demands. To achieve effective team performance, team members had to develop appropriate knowledge and skills in order to comprehend the patterns of role exchange and the relation of differing network patterns to changing task demands (Kozlowski et al., 1999). In order to examine such performance and determine if the appropriate knowledge and skills are being developed, we adopted a process-oriented, developmental perspective and assessed team performance under changing task demands.

Objective task performance scores. Individual task performance scores were calculated for each station based on requisite duties. For example, the calculation of the performance score for Fleet Services was based on (a) whether the aircraft was cleaned, (b) whether meals were delivered, (c) whether duties were performed in the appropriate sequence in relation to teammates’ duties, and (d) whether the required information was

communicated to teammates. Individual task performance scores were calculated for each aircraft *or* discrete adaptive event in a session. A total of ten individual performance scores were calculated: five aircraft in Session 1, three aircraft in Session 2, one repurposing event in Session 2 (associated with the departure of aircraft 3), and one communication failure in Session 2 (two minutes into the repurposing event). The scores were then standardized to allow comparison across aircraft and adaptive events. Performance scores for the first eight aircraft (five in Session 1 and first three prior to repurpose event in Session 2) are considered standard performance because the situation was relatively static and consistent with the training scenario. Based on the eight individual aircraft scores, composite scores were then created for Session 1 and Session 2 to represent standard performance. Conversely, the performance scores for the repurposing and communication failure events are considered adaptive due to the increased complexity inherent in the events. As the communication failure overlapped the repurposing event, a composite score was created to represent adaptive performance.

Subjective task performance scores. Griffin and Hesketh's (2003) adaptive performance rating scale was used to obtain subjective performance scores. The rating scale is composed of twenty items which tap seven out of eight of the Pulakos et al. (2000) dimensions. Similar to Griffin and Hesketh's study, the eighth dimension (i.e., physical adaptability) was excluded as it was irrelevant to task requirements. Participants were asked to rate their own performance as well as the performance of their four teammates using a 7-point scale (1 = performed very poorly, 7 = performed very well), with the option of responding *not applicable*. A single-factor ANOVA was conducted to ensure similarity in ratings across self and peers. Ratings were not significantly different,

$F(5, 1125) = 2.22$, $p = 0.16$, and were therefore collapsed to create a single adaptive performance rating per subject. Two items assessed *handling crisis situations* (e.g., Was able to take an alternate course of action to deal with a new and urgent priority), and they were highly correlated, $r = .58$, $p < .001$. The remaining six dimensions were assessed by three items. Example items and subscale alphas are as follows: *problem solving* ($\alpha = .93$) - Was able to look at problems from many different angles; *new learning* ($\alpha = .93$) - Learned new skills, knowledge or ways of doing things to keep up to date with the changing situation; *interpersonal adaptability* ($\alpha = .95$) - Was flexible and open-minded when dealing with teammates; *cultural adaptability* ($\alpha = .92$) - Integrated well with teammates of a different background or culture; *copes with uncertainty* ($\alpha = .94$) - Was able to function in the face of uncertainty or ambiguity; *copes with stress* ($\alpha = .94$) - Remained calm and composed when faced with demanding work loads.

Although conceptually the content of the subscale questions correspond to their dimension labels, the dimensions did not hold psychometrically. An exploratory factor analysis was conducted in SPSS to determine which, if any, dimensions were supported. Entering all 20 items, a principal axis factor analysis with promax rotation supported only a unidimensional scale. Indeed, 89% of the variance was explained by the first component and the eigenvalue of the second component did not exceed .3. Findings did not psychometrically support Pulakos et al.'s (2000) dimensions, or Griffin and Hesketh's (2003) application of the TWA three-factor theory to the dimensions. Given these results, a composite score based on the full scale was used to test hypotheses. The reliability of the full scale was high with a chronbach's alpha of .97.

Materials

Personality. Goldberg's (1999) 50-item International Personality Item Pool – Five-Factor Model (IPIP-FFM) measure of personality was used in the present study (for further scale information, see http://ipip.ori.org/). Participants were asked to rate their agreement with each item based on a 5-point scale (1 = strongly agree, 5 = strongly disagree). The reliabilities were as follows: extraversion $\alpha = .84$, conscientiousness $\alpha = .84$, neuroticism $\alpha = .82$, and openness $\alpha = .76$.

Cognitive ability. The Wonderlic Personnel Test (Wonderlic, 1983) was used to assess general cognitive ability. The Wonderlic is a 12-minute timed test of general verbal, math, and analytical abilities. Reported test-retest reliabilities for the Wonderlic ranged from .82 to .94, and internal consistency reliability ranged from .88 to .94 (Wonderlic, 1983). Scores are calculated by summing the total correct items for a subject.

Self-efficacy. The measure used in the present study was based on the self-efficacy measure developed by Griffin and Hesketh (2003). The 14-item measure is specific to self-efficacy beliefs pertaining to adaptive behaviors and was developed to match the dimensions of the adaptive performance taxonomy (Pulakos et al., 2000). The items were modified in the present study to align with the experimental task. Using a 5-point scale (1 = not at all confident, 5 = certain), participants rated their confidence in their being able to achieve each of the behaviors as they pertain to the task. For example, "Rate your level of confidence in being able to adjust to new processes or procedures" and "…form good relationships with people of different cultures." To account for changes in beliefs due to task experience, the scale was administered twice: once

following the training session (α = .94) and again following the first task session (α = .95).

Adaptive profile. Considering Sevensson et al.'s (2005) findings, the profile of an adaptive worker appears to be based on an amalgamation of various cognitive and personality components. To be an effective adaptive performer, one must have conducive information processing capabilities (e.g., low need for cognitive structure) as well as conducive personality characteristics (e.g., high emotional stability), which again, is consistent with the very definition of adaptive performance (Allworth & Hesketh, 1999). Given the extensive and rigorous research efforts of the NATO team, their validated measures were used in the present research to assess various cognitive and affective indicators of adaptive performance. In addition to the personality measure mentioned above, the measures of Need for Cognitive Structure, Personal Need for Structure, Personal Fear of Invalidity, Cultural Adjustment, and Emotion Regulation were used in the present study. As depicted in Figure 3, these measures were intended to serve as indicators of the aforementioned factor structure that captures the adaptive profile of an individual. However, the measurement model for the three-factor structure was not supported. The results of the factor analysis are reviewed in the following section.

Need for Cognitive Structure (NCS). The NCS is a 20-item scale that assesses an individual's tendency to use cognitive structuring for decision-making, especially if the situation involves uncertainty. An example item is "I prefer things to be predictable and certain." Participants rated their level of agreement with each item using a 5-point scale (1 = strongly disagree, 5 = strongly agree). Individuals high in NCS (e.g., those that

would strongly agree with the example item) rely more on scripts, schemas, and past experiences to cognitively structure a situation in an effort to gain certainty (Bar-Tal, 1994; Svensson et al., 2005). Low NCS individuals use more complex decision-making processes, such as hypothesis generation, and they are more willing to re-evaluate a decision when presented with new information. The reliability for the scale was acceptable ($\alpha = .86$), and a single composite score was calculated based on the average of all 20 items.

Personal Need for Structure (PNS). The PNS is a 12-item scale that assesses the degree to which individuals prefer structure and clarity in situations and dislike ambiguity (Thompson, Naccarato, Parker, & Moskowitz, 2001). PNS is thought to be characterized by two factors: (a) desire for structure, such as preference for situations and activities that are structured and predictable, and (b) response to lack of structure, such as experienced anxiety and/or discomfort in situations perceived to lack structure (Svensson et al., 2005). Respectively, example items of the two factors are "I find a well ordered life with regular hours tedious" (reversed scored) and "I become uncomfortable when the rules of a situation are not clear." However, Thompson et al.'s (2001) results supported a one-factor structure, which accounted for 37.8% of the variance and had an alpha of .84. The full-scale reliability in the present study was similar ($\alpha = .84$). Participants were asked to rate their level of agreement with each item using a 5-point scale (1 = strongly agree, 5 = strongly disagree), and a single composite score was calculated based on the average of all items. Note that a preference for structure is assessed by both the NCS scale and the Personal Need for Structure (PNS) scale. However, the NCS is more specific to decision-making activities, whereas the PNS assess a general preference for structure.

Personal Fear of Invalidity (PFI). Whereas individuals high in PNS are driven by *needs* for structure, individuals high in PFI are driven by a *concern* with committing errors when confronted with decision-making (Thompson et al., 2001). They tend to be preoccupied with the consequences and perceived risks associated with an undertaking and apprehensive of evaluation. In an effort to avoid potential mistakes, they may vacillate between options and resist commitment to situations or options, resulting in delayed responses (Svennson, et al., 2005). Thompson and colleagues found the PNS and PFI to be moderately positively related. They suggested that high PNS and PFI individuals tend to seek out structure as a means to clarify a situation in an effort to lower the possibility of committing an error. The PFI is a 14-item measure that uses a 5-point response scale (1 = strongly agree, 5 = strongly disagree). An example item is "I wish I did not worry so much about making errors." The reliability found in the present study was $\alpha = .79$.

Cultural Adjustment (CA). The Intercultural Adjustment Potential Scale (ICAPS; Matsumoto et al., 2001) was developed as a generalizable measure of cultural adjustment. As opposed to assessing context- or cultural-specific knowledge or attitudes, ICAPS taps underlying psychological skills that facilitate adaptation and cultural adjustment. The 55-item scale taps four constructs that are purported to be necessary for effective intercultural adjustment: emotion regulation, openness, flexibility, and critical thinking. Emotion regulation is concerned with the experience of negative emotions and overly emotional reactions to the environment (example item: "I get angry easily"). Openness as measured by ICAPS is tantamount to the personality factor of openness to experience. Flexibility is intended to assess flexibility with regard to traditional ideas and social roles

(example item: “I think women should have as much sexual freedom as men”). Finally, critical thinking (or creativity) assesses a desire for self-direction and freedom from arbitrary constraint (example item: “The average citizen can influence governmental decisions”). Extensive validation studies (Matsumoto et al., 2001; Matsumoto et al., 2003) indicated that full scale ICAPS possessed excellent test-retest and parallel forms reliability, but the internal reliability was highly variable (coefficient alpha ranged from .44 to .93); the lowest alpha value was based on a translated version of ICAPS. A factor analysis conducted by Matsumoto and colleagues (2001) revealed relatively poor coefficient alphas for the four individual factor constructs (.64, .60, .56, .43, respectively), and together the four factors accounted for only 18.6% of the total variance (Matsumoto et al., 2001). Further validation was suggested.

In the interest of parsimony, the full 55-item ICAPS scale was not used in the present study. All items pertaining to the openness factor in ICAPS were excluded as the assessment of this factor was redundant with openness to experience as captured by the IPIP personality scale. Based on Matsumoto et al.’s (2001) results, only those items that exceeded their established criterion for factor loadings, ≥ 0.196, were included in the present study in an effort to increase reliability. Thus, for the remaining three factors, 9 items assessed emotional regulation, 6 items assessed flexibility, and 6 items assessed creativity. The factors of flexibility, creativity, and openness (as measured by the IPIP) were combined in a composite score representing cultural adjustment ($\alpha = .75$). As described below, the factor of emotion regulation will be extracted as a separate measure. Participants were asked to rate their agreement on a 5-point response scale (1 = strongly agree, 5 = strongly disagree).

Emotion Regulation (ER). Consistent with Svennson et al. (2005), the ICAPS subscale assessing emotion regulation was used as a separate measure purported to load on the latent variable of adaptability (see Figure 3). The response scale is the same as reported above for the full ICAPS. High scores denote poor emotional regulation. The reliability was sufficient with a chronbach alpha of .77 after deleting item 21, "People should not care what other people do."

Stress appraisals. As opposed to the two-item measure of appraisals used in previous research (e.g., Tomaka, et al., 1993), the present study used an expanded, ten-item measure of stress appraisals developed and validated by Schneider (in press). Seven items assessed primary appraisals (example item: "How threatening to you expect the upcoming task to be"), and three items assess secondary appraisals ("How able are you to cope with this task"). Participants were asked to respond on a 5-point response scales. As with self-efficacy, the stress appraisals scale was administered twice (following training and again following the first task session) to account for changes in appraisals due to continued task experience. The reliabilities for both administrations were acceptable: at Time 1, primary appraisals $\alpha = .74$, secondary appraisals $\alpha = .86$; at Time 2, primary appraisals $\alpha = .82$, secondary appraisals $\alpha = .88$. A ratio (primary/secondary) was calculated to yield an overall stress appraisal score. Using this ratio, high scores denote greater threat and lower scores denote challenge (a more adaptive evaluation).

Procedure

Experimental sessions, lasting approximately 2.5 hours, were composed of a single team of five participants. Each participant was randomly assigned to a task station, where they remained throughout the experimental session, completing all questionnaires

and task activities. After obtaining participants' consent, they were asked to complete a test of cognitive ability and a battery of pre-task questionnaires including: (a) personality, (b) need for cognitive structure, (c) personal need for structure, (d) personal fear of invalidity, (e) cultural adjustment, (f) emotion regulation, and (f) standard demographics. All questionnaires were presented on the computer. After completing the pre-task questionnaires, participants received task instructions and training, followed by two 30-minute task sessions.

The training phase began as a self-directed slide show presentation on participants' individual computers. Participants were free to proceed through the slide show at their own pace and were permitted to page back to review slides at their discretion. The training presentation included general and specific training slides. The general training provided an introduction to aerial port operations and the overall team goals of the CAPS task. The specific training detailed the role of a single station, including the individual goals and responsibilities, the points of contact, and keyboard-related training on how to accomplish specific task activities. At the end of both the general and specific training slides, participants were quizzed to ensure comprehension of the material. If a participant missed a question on the quiz, they were provided with the correct answer. Once all participants completed the training presentation, which took an average of 15 minutes, they started a hands-on practice session. This practice session allowed participants to familiarize themselves with the task as well as their teammates. The training slides (general and specific) were available in a drop-down menu for participants to view at their discretion during the practice session. The average time of the full training phase was 30 minutes. Following the training phase, participants

completed two more questionnaires (self-efficacy and stress appraisals) and then proceed on to the first 30-minute task session. At the end of Session 1, the self-efficacy and stress appraisals were administered again, along with the first administration of the manipulation check. After completion of the scales, participants began Session 2. Following Session 2, the manipulation check was administered again, and participants were asked to complete the subjective performance appraisal rating scale.

III. RESULTS

Manipulation Check

As expected, participants reported significantly more difficulty in the second task session (M = 3.03, SD = 1.15) relative to the first session (M = 2.81, SD = 1.23; $t(230) = -2.57$, $p < .01$). Moreover, participants reported significantly more adaptive behavior was required in the second session (M = 3.55, SD = 0.96) than the first session (M = 3.09, SD = 1.07; $t(226) = -5.78$, $p < .001$). As a high degree of task interdependence was inherent in both sessions, there was not a significant difference reported for the average of the two items assessing task interdependence: M = 4.15, SD = 0.84 (session 1); M = 4.13, SD = 0.84 (session 2); $t(226) = 0.27$, $p > .05$. Thus, consistent with the intent of the task design, the second session was more difficult and required an adaptive response, which was indeed perceptible to the participants.

Part 1

The purpose of this first step was to investigate the convergent validity of subjective and objective measures of adaptive performance. The subjective measure assessed adaptive performance via self and peer ratings based on the dimensions established by Pulakos et al. (2000). The objective measure assessed adaptive performance via task performance scores following a task disruption which required adaptation in task procedures. The underlying assumption inherent in previous research is that the same construct, adaptive performance (AP), is being assessed with equal predictability and relative interchangeability (i.e., the construct validity is assumed). To

empirically examine this assumption, an estimate for the Pearson product-moment correlation between the subjective and objective AP measures was obtained; the greater the magnitude of the correlation, the stronger the support for convergent validity (Bommer et al., 1995). Furthermore, part one examined the construct validity and interchangeability of adaptive performance measures by comparing the amount of variance accounted for in each criterion measure by various predictors. If the two measures are interchangeable, the amount of variance accounted for by a particular predictor should be equal for both measures. An alpha level of .05 was used for all statistical tests.

Table 2 provides an overall correlation matrix of all study variables included in hypothesis tests, in reference to both Part 1 and Part 2. Addressing the results of Part 1 first, with both subjective and objective measures of AP included in the matrix, the first two columns of Table 2 represent a quasi multitrait-multimethod matrix (Campbell & Fiske, 1959). Figure 4 provides a visual interpretation of the relationship between subjective and objective measures of AP.

The correlations suggest a modicum of support for the convergent validity of the adaptive performance construct in that the correlation between measures of adaptive performance, $r = .52$, was significantly different from zero and was the strongest relationship for either adaptive performance measure. Furthermore, with the exception of conscientiousness and possibly cognitive structure, the pattern of relationships with other constructs in the matrix is relatively similar across measurement methods. However, given that there was only 27% shared variance between the subjective and objective measures (i.e., $.52^2$), a regression analysis further examined the relationship of objective

Table 2

Descriptive Statistics and Correlations for Study Variables

	M	*SD*	1	2	3	4	5	6	7	8	9	10	11	12	13
1. Subjective AP	*5.6*	*.75*	-												
2. Objective AP	*.03*	*1.0*	.52***	-											
3. Cognitive ability	*21*	*6*	.30***	.30***	-										
4. Self-efficacy	*3.5*	*0.7*	.40***	.24**	.28**	-									
5. Stress appraisals	*1.7*	*1.1*	-.24**	-.25**	-.17	-.56***	-								
6. Openness	*5.0*	*0.7*	.13	.03	.25**	.21*	-.01	-							
7. Extraversion	*4.8*	*1.0*	.11	-.05	-.07	.17	-.01	.10	-						
8. Conscientiousness	*4.9*	*0.9*	.22*	.09	.08	.30**	-.15	.06	.37***	-					
9. Neuroticism	*3.1*	*1.0*	-.12	-.05	-.08	-.30**	.33**	.09	-.35***	-.42***	-				
10. Emotion regulation	*3.6*	*1.1*	-.07	.02	-.12	-.26**	.25**	-.03	-.29**	.43***	.81***	-			
11. Cultural adjustment	*4.9*	*0.5*	.19*	.18	.21*	.19*	.01	.80***[1]	.25**	.09	-.03	-.12	-		
12. Cognitive structure	*4.3*	*0.8*	-.20*	-.13	-.33***	-.16	.14	-.29**	-.05	.02	.26**	.36**	-.39***	-	
13. Personal structure	*4.0*	*0.9*	-.18	-.06	-.19*	-.14	.11	-.24**	-.23*	-.01	.35***	.40***	-.36***	.82***	-
14. Fear of invalidity	*4.2*	*0.8*	-.07	.07	-.04	-.20*	.28**	-.04	-.35***	-.35***	.56***	.62***	-.01	.29**	.37***

Note. * $p < .05$, ** $p < .01$, *** $p < .001$. $N = 114$, using listwise deletion. [1]High correlation was due to Openness being a component of Cultural Adjustment. Internal reliability coefficients for measures are presented in the method section; all reliabilities exceeded $\alpha = 70$.

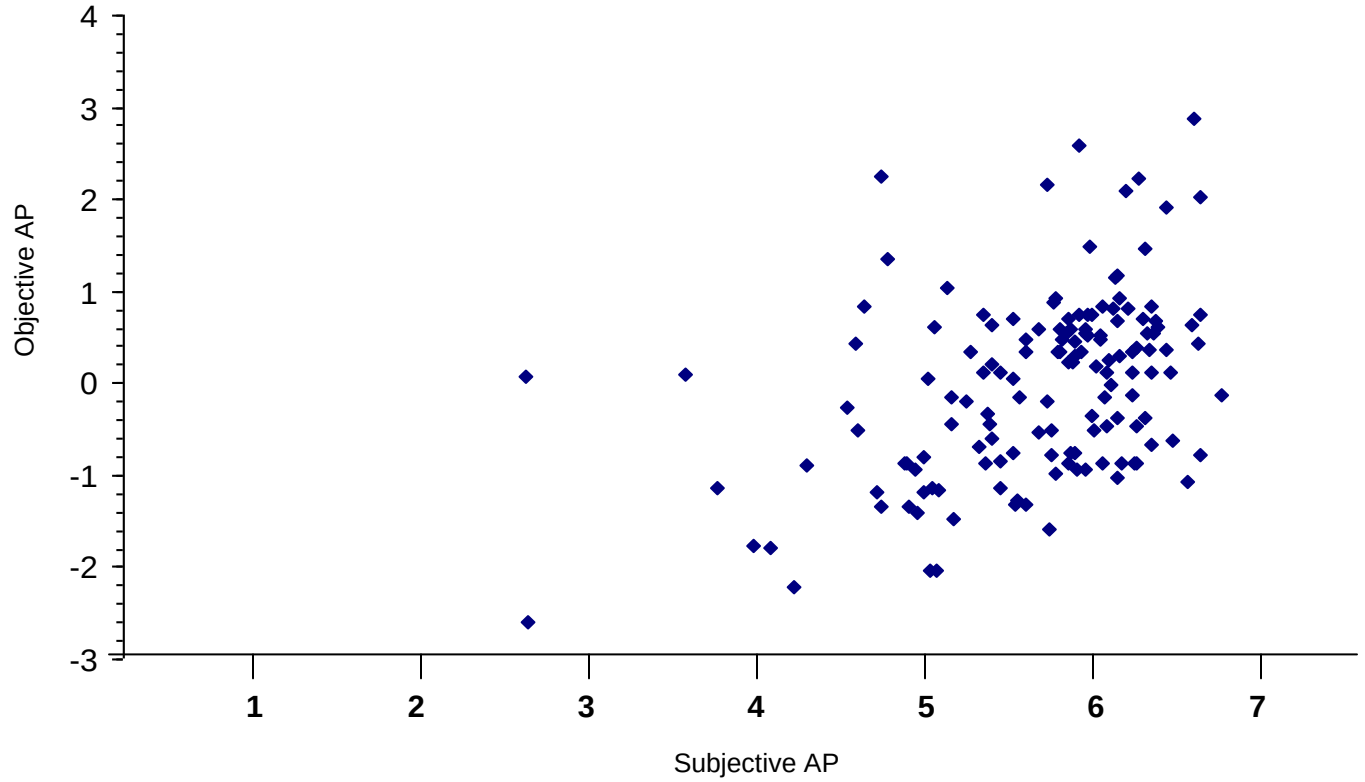

Figure 4. Scatter plot of objective and subjective adaptive performance. Objective AP in standardized form.

and subjective measures of adaptive performance. Controlling for objective performance in Session 1 (average of five aircraft scores during Session 1) and Session 2 (average of first three aircraft scores prior to the repurpose event), subjective adaptive performance explained a significant portion (R^2 = .05) of incremental variance in objective adaptive performance, *F-Change* (1, 141) = 9.82, $p < .01$. These results suggest that regardless of measurement method, adaptive performance is uniquely being captured by both objective and subjective measures. Subjective adaptive performance explained the greatest amount of unique variance (β = .26**) in objective adaptive performance, beyond that accounted for by baseline objective performance: Session 1 β = .19*, Session 2 β = .19*. Although these results are promising and suggest that the same construct is likely being captured, with only 27% shared variance the support was not strong enough to warrant a composite measure of adaptive performance in the present study (Bommer et al., 1995). Therefore, separate analyses, using both subjective and objective measures as outcomes, were conducted.

Part 2

Hypotheses 1 and 2. A hierarchical regression analysis was conducted to examine the positive relationships with adaptive performance posited for cognitive ability, personality, and self-efficacy. The results are presented in Table 3, where subjective AP results are in parentheses and objective AP results are above parentheses. AP was regressed on the posited predictors in three steps: cognitive ability in Step 1; openness to experience, conscientiousness, extraversion, neuroticism in Step 2, and self-efficacy in Step 3. Steps 1 and 2 of the regression analysis were examined for Hypothesis 1, which was partially supported. As shown in Table 3, cognitive ability was a significant

Table 3

Hierarchical Regression Analyses for Hypotheses 1 and 2

Variable: N = 122 (170)	β	R^2	ΔR^2
Step 1			
Cognitive ability	.29** (.26**)	.08** (.07**)	
Step 2			
Cognitive ability	.29** (.26**)		.00 (.02)
Openness	-.01 (.01)		
Conscientiousness	.03 (.06)		
Extraversion	.00 (.10)		
Neuroticism	-.01 (-.01)		
Step 3			
Cognitive ability	.24** (.19*)		.03* (.14***)
Openness	-.04 (-.04)		
Conscientiousness	.00 (.01)		
Extraversion	-.02 (.07)		
Neuroticism	-.03 (-.05)		
Self-efficacy	.19* (.40***)		

Note. * $p < .05$, ** $p < .01$, ***$p < .001$. Subjective AP in parentheses, objective AP above parentheses.

predictor of AP (subjective AP: $\beta = .26$, $p < .05$; objective AP: $\beta = .29$, $p < .05$), but the personality variables did not significantly enhance prediction. However, in support of Hypothesis 2, the obtained results from entering self-efficacy at Step 3 supported a significant, unique increment in the prediction of adaptive performance above and beyond cognitive ability and personality (subjective AP: $\beta = .40$, $\Delta R^2 = .14$, F (1, 163) = 29.97, $p < .001$; objective AP: $\beta = .19$, $\Delta R^2 = .03$, F (1, 115) = 4.00, $p < .05$). Although personality was not related to AP in the present study, the results for Hypotheses 1 and 2 indicated cognitive ability and self-efficacy were independently related to AP in a positive direction.

Hypothesis 3. Task requirements were expected to moderate the relationship between individual adaptive characteristics (i.e., self-efficacy) and adaptive performance. Task requirements for the first several aircraft during Session 2 were considered minimal as participants had ample task experience given their completion of training and Session 1. That is, task requirements were consistent with those presented during training and performed for all prior aircraft in Session 1. Task requirements during the repurposing and communication failure event were considered complex as the activities participants were asked to perform were inconsistent with training and prior experience. As all subjects were exposed to both conditions, high (complex) and low (minimal) task requirements, a mixed design repeated measures ANOVA was conducted with task requirements (low and high) as the within-subjects factor and self-efficacy (median split) as the between subjects factor.

The interaction of self-efficacy and task requirements was not significant, $F(1,145) = .01$, $p > .10$. Additional exploratory regression analyses were conducted to

examine the relationship of self-efficacy and adaptive performance under high and low task requirement conditions independently. Note that as these analyses were for exploratory purposes, the within subject variance across task requirement conditions was not accounted for. Under low task requirements (aircraft one, Session 2) the regression slope is significant, $\beta = .15$, $p < .05$, whereas under high task requirements (repurposing and communication failure) the regression slope is greater, $\beta = .23$, $p < .01$. However, the statistical significance between the slopes cannot be tested as the within subject variance is not accounted for.

Hypothesis 4. Adaptive performance was regressed on stress appraisals to examine the negative relationship posited in Hypothesis 4, where higher stress appraisal scores denote threat and are related to lower adaptive performance. Stress appraisals were assessed twice, following training and again following Session 1; the post-session stress appraisal scores were used to examine Hypothesis 4. As reported previously, the reliability of stress appraisal scores was higher at post-session assessment, the two assessments were strongly correlated ($r = .52$, $p < .001$), and as the post-session assessment was closer in time to the adaptive performance event, it was deemed most applicable. In support of Hypothesis 4, stress appraisals significantly predicted AP (subjective AP: $\beta = -.24$, $t(243) = -3.84$, $p < .001$; objective AP: $\beta = -.21$, $t(145) = -2.62$, $p < .01$), indicating higher stress appraisals (i.e., threat appraisal) relate to lower adaptive performance.

Hypothesis 5. The direct relationships for the latent variables of the adaptive profile (instability, adaptability, and need for structure) with adaptive performance, as posited in Hypothesis 5, could not be examined as the measurement model for the initial

three-factor structure was not supported. The results of a confirmatory factor analysis (CFA) conducted using the AMOS program indicated that the three-factor structure as depicted in Figure 5 did not fit the data well: $N = 263$, $\chi^2(6) = 41.89$, $p < .001$; CFI = .94, SRMR = .09[1]. Given the strong correlation ($r = .81$, $p < .001$) and conceptual similarity of Matsumoto et al.'s (2001) emotional regulation measure and the FFM personality measure of neuroticism, it is theoretically plausible that these two measures tap the same latent factor, namely instability. In addition, the standardized residual covariance matrix indicated a high degree of covariance between cultural adjustment and need for personal structure (-5.14) as well as with need for cognitive structure (-4.52), both exceeding the cut level of 2.58 (Byrne, 2001). Such results suggest that switching the loading for cultural adjustment to the need for structure latent variable would be more representative of the population data.

Based on the above results and verifying conceptual clarity, the measurement model was respecified as a second-order model (Figure 6). Need for structure was reconceptualized as 'cognitive-oriented adaptability' and instability was reconceptualized as 'affective-oriented adaptability.' Both factors in turn are indicators of the second order construct of adaptability, which is intended to represent general adaptive tendencies. Need for cognitive structure and need for personal structure were reversed scored, with positive scores denoting less preference for structure, to align with the cultural adjustment scale and load positively on 'cognitive adaptability.' Similarly, neuroticism,

[1]Due to the relatively small sample size, the Comparative Fit Index (CFI) and the Standardized Root Mean Square Residual (SRMR) fit indexes are presented for all SEM analyses. According to Hu and Bentler (1998), the CFI and SRMR are highly recommended fit indexes and are among the least sensitive to small sample sizes. In addition to a non-significant chi-square, a CFI > .95 and a SRMR < .10 indicate good model fit (Kline, 1998).

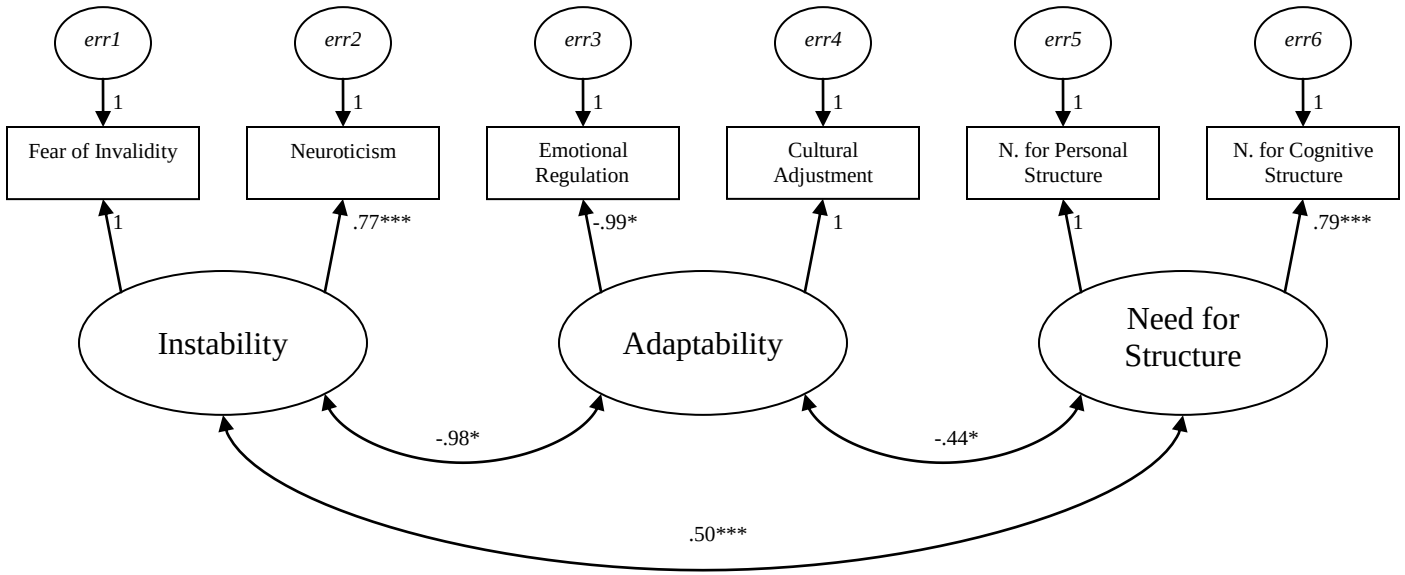

Figure 5. CFA for proposed three-factor measurement model (standardized estimates reported).

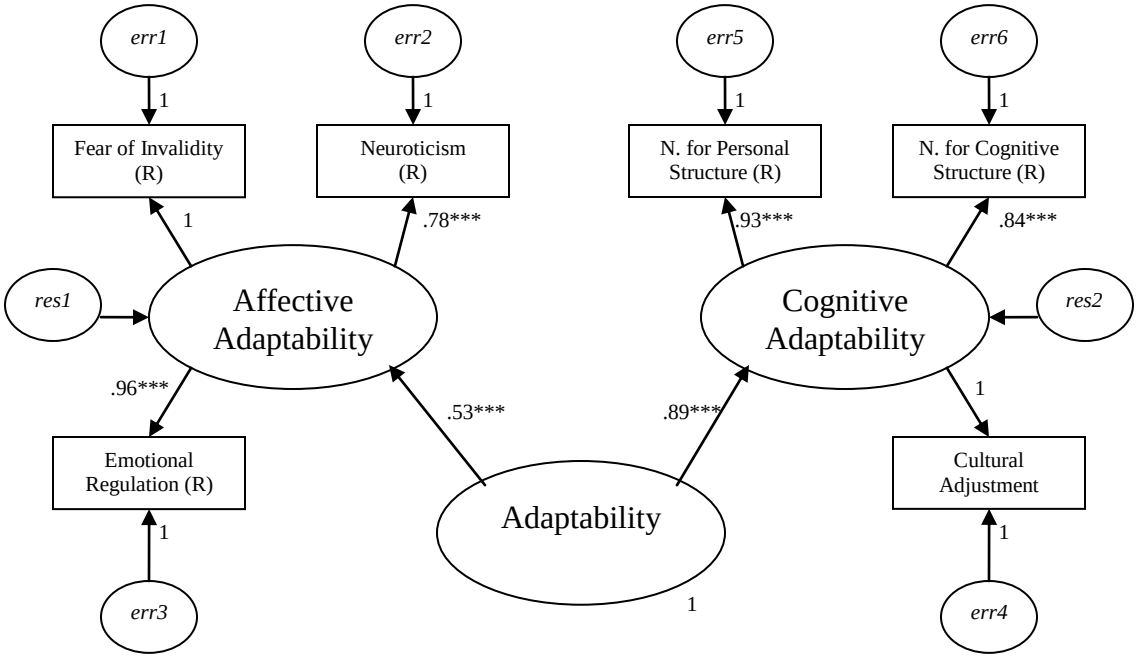

Figure 6. Respecified second-order measurement model (standardized estimates reported). Reverse scores (R) used for several indicators to permit positive loadings on latent factors.

fear of invalidity, and emotional regulation were reversed scored so as to load positively on 'affective adaptability.' To ensure the higher order structure was identified, equality constraints were placed on the higher order residuals after verifying their similarity: discrepancy of .01 in estimated variances with a critical ratio < 1.96, suggesting the two residual variances are equal in the population. The fit indexes for the respecified model were superior and indicated good fit: $N = 263$, $\chi^2(8) = 9.52$, $p = .30$; CFI = .99, SRMR = .03. Although the difference between the two models cannot be tested for significance as they are not nested, the fit indexes reflect a clear advantage for the respecified model. In the absence of support for the initial three-factor structure, the latent variable scores of instability, adaptability, and need for structure could not be created, and therefore their relationship with adaptive performance as posited in this hypothesis could not be examined. Alternatively, the six indicator scores (need for cognitive structure, need for personal structure, fear of invalidity, emotional regulation, cultural adjustment, and neuroticism) of the latent variables were used to examine dispositional predictors of AP. The results of the regression analysis used to examine these relationships are presented in Table 4. Although cultural adjustment approached significance in predicting objective AP, $\beta = .15$, $p = .09$, Hypothesis 5 was not supported as none of the indicators significantly contributed to a direct prediction of AP (subjective AP: $R^2 = .01$, F (6, 227) = 0.71, $p > .10$; objective AP: $R^2 = .04$, F (6, 137) = 1.06, $p > .10$).

Hypothesis 6. To test the hypothesized mediating relationship of self-efficacy, the statistical program AMOS (Arbuckle, 1997) was used to analyze the proposed hybrid (measurement and path) structural equation. A few modifications and underlying model specifications should be noted. For the measurement portion, the respecified

Table 4

Hierarchical Regression Analyses for Hypothesis 5

Variable: N = 144 (234)	β	R^2
Need for cognitive structure (R)	-.19 (-.10)	.04 (.14)
Need for personal structure (R)	.12 (.03)	
Fear of invalidity (R)	.01 (-.02)	
Emotion regulation (R)	.19 (.11)	
Cultural adjustment	.15 (.08)	
Neuroticism (R)	-.18 (-.08)	

Note. * $p < .05$, ** $p < .01$, ***$p < .001$. Subjective AP in parentheses, objective AP above parentheses.

measurement model (Figure 6) was used as opposed to the proposed measurement model depicted in Figure 3. Given that the results of Study 1 did not support a composite measure, both subjective and objective measures of AP were included in the hybrid model. As both measures are intended to capture the same underlying construct, they likely share a common omitted cause, therefore their disturbance terms were permitted to covary (Kline, 1998). Stress appraisals were respecified as a first-order mediator of adaptability due to the non-significant relationship between adaptability and self-efficacy ($\beta = .12$, $p > .05$) after controlling for the relationship between adaptability and stress appraisals ($\beta = .12$, $p < .001$).

This respecification made conceptual sense considering the continuum of proximity associated with the variables and behavior (i.e., adaptive performance). To clarify, moving from distal influences to proximal influences on adaptive performance, the latent factor of adaptability captures dispositional characteristics (distal), stress appraisals are task specific capturing relationships with *general* performance, and self-efficacy (proximal) as measured in the present study is specific to beliefs regarding *adaptive* performance. If a single measure is modeled as an observed exogenous variable, it is assumed to be measured without error; an assumption usually violated (Kline, 1998). Therefore, the alternative approach of modeling a single observed variable as an indicator of a single latent factor was used for cognitive ability. This approach permits an error term with an a priori specified variance to be included for the observed variable. Finally, a path from cognitive ability to cognitive adaptability was included.

With the above model specifications established, an iterative process of model comparison, theoretically and statistically based, was used to examine the mediating

relationships posited in Hypothesis 6. The initial model analyzed represents a baseline model and includes direct and indirect relationships with both measures of adaptive performance (see Figure 7). The overall fit indexes for the model suggest acceptable fit: $N = 114$, $\chi^2(34) = 40.3$, $p = .21$; CFI = .99, SRMR = .06. However, with the exception of cognitive ability (subjective AP: $\beta = .20$, $p < .05$; objective AP: $\beta = .26$, $p < .01$), several of the direct relationships with adaptive performance were not statistically significant. According to Kline (1998), non-significant direct effects in the presence of significant indirect effects in SEM indicate strong support for mediation. Thus, this statistical evidence aligned with the theoretical proposition of self-efficacy's mediating effect, and therefore the non-significant paths were eliminated in the analysis of a second, parsimonious model (see Figure 8). As expected, with several paths trimmed from the model, the χ^2 statistic for the parsimonious model increased: $N = 114$, $\chi^2(39) = 46.5$, $p = .21$; CFI = .98, SRMR = .07. However, as indicted by the χ^2 difference test in Table 5, the model fit did not significantly depreciate under the more parsimonious model. Thus, Hypothesis 6 was supported in that the latent factor of adaptability was fully mediated by stress appraisals, which are in turn, fully mediated by self-efficacy. Cognitive ability was only partially mediated by self-efficacy.

Although the above results support the mediating role of self-efficacy and stress appraisals, tests of significance were conducted separately for the indirect effects associated with subjective AP and objective AP. Following Kline's (1998) procedure, results indicated that only the indirect effects associated with subjective AP were statistically significant (see Table 6). The non-significant results for indirect effects associated with objective AP are likely due to the fact that the path loading for self-

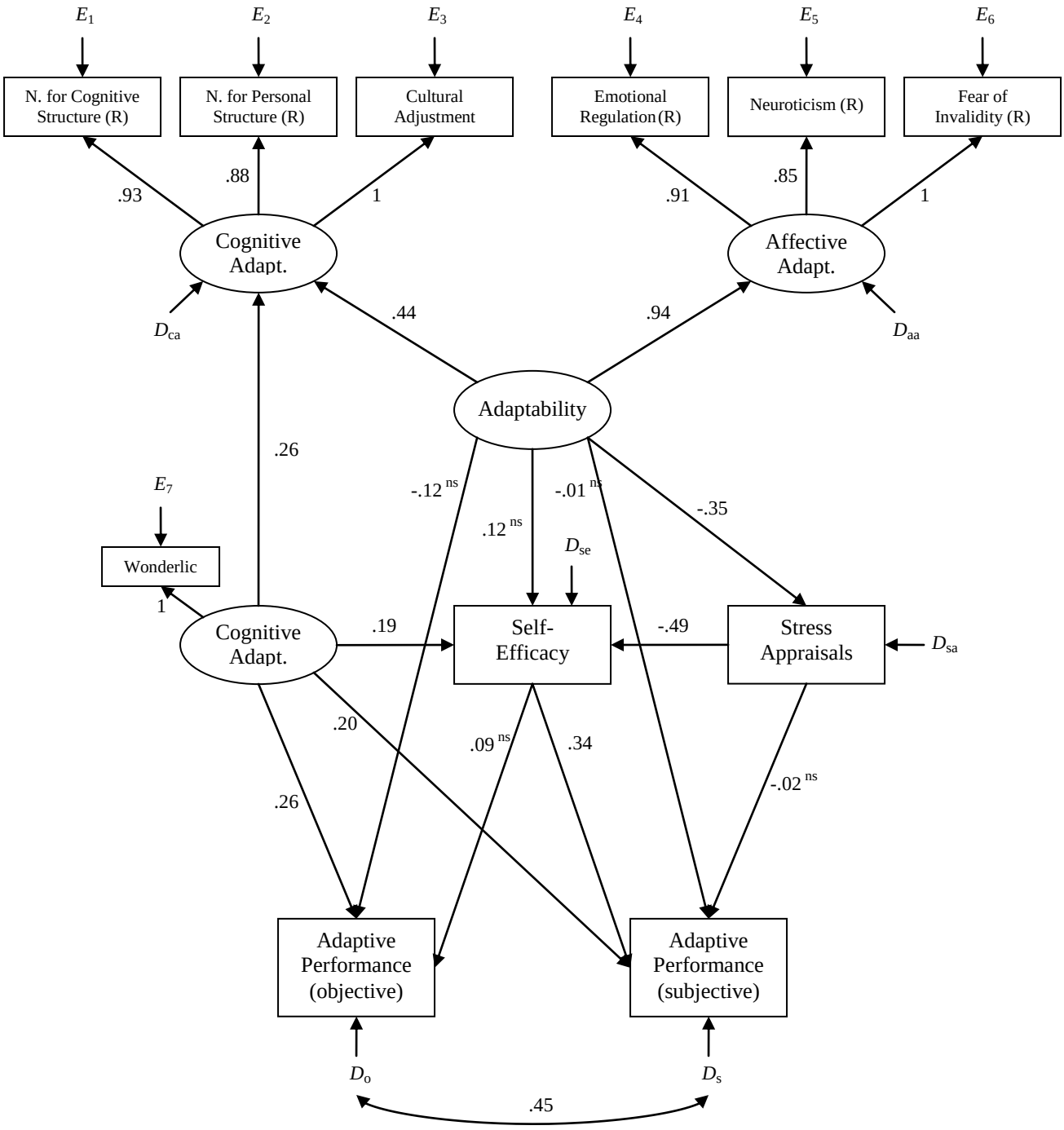

Figure 7. Results for the baseline path model of adaptive performance. Unless specified (ns), all paths are significant at $p < .05$. Standardized regression coefficients reported. $N = 114$, $\chi^2(34) = 40.3$, $p = .21$; CFI = .99, SRMR = .06.

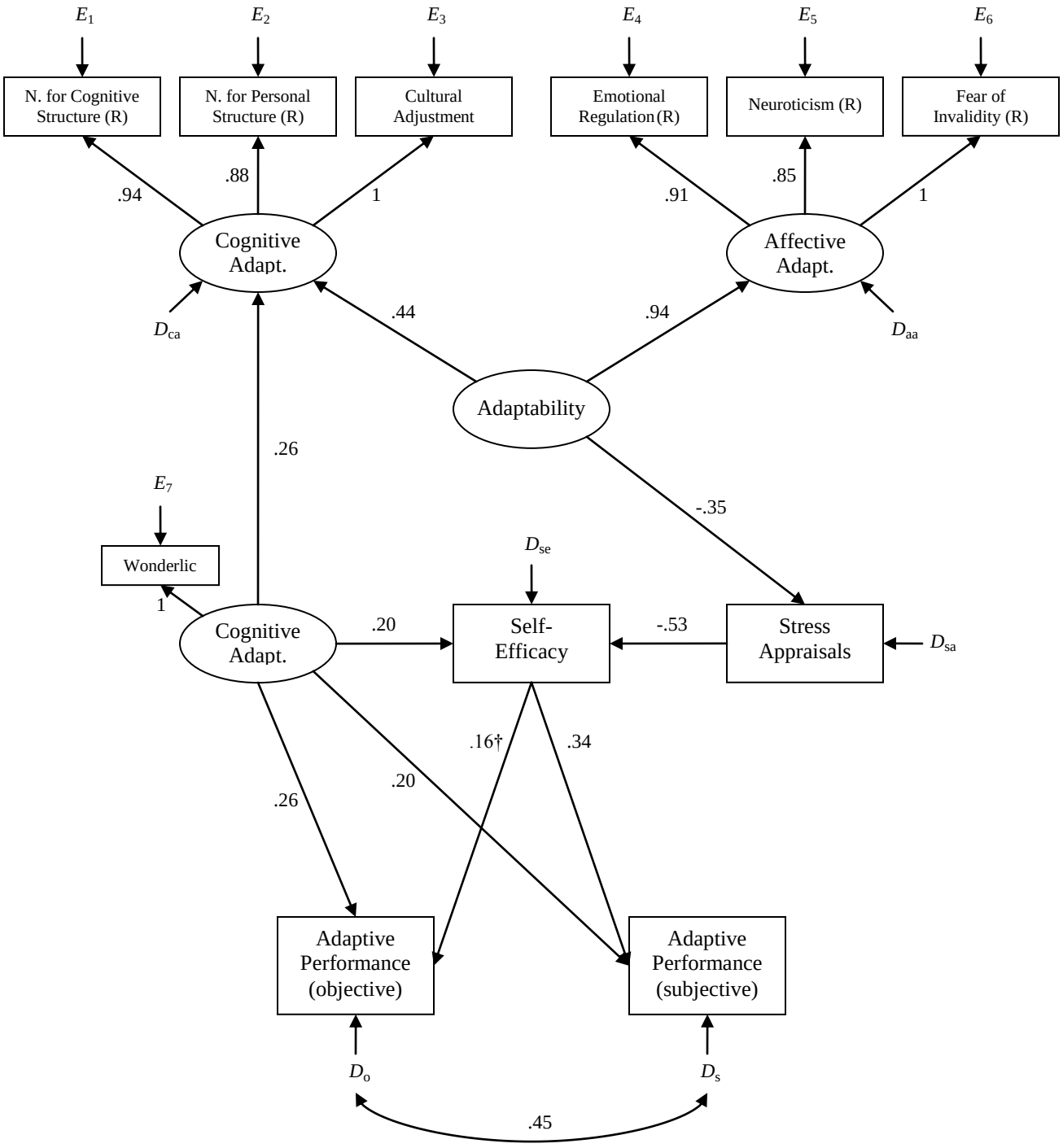

Figure 8. Results for a parsimonious path model of adaptive performance. All paths are significant at $p < .05$ with the exception of Self-Efficacy to Objective AP, which is marginally significant at $p = .07$ (†). Standardized regression coefficients reported. $N = 114$, $\chi^2(39) = 46.5$, $p = .19$; CFI = .98, SRMR = .07.

Table 5

Summary of Fit Indexes and Chi-Square Difference Tests for all Models Examined

Model (N = 114)	χ^2	df	Contrast with baseline model		CFI	SRMR
			$\chi^2_{difference}$	$df_{difference}$		
Baseline model (Fig. 7)	40.3*ns*	34	n/a	n/a	.99	.06
Parsimonious model (Fig. 8)	46.5*ns*	39	6.2*ns*	5	.98	.07
Exploratory model (Fig. 9)	40.5*ns*	33	n/a	n/a	.98	.06

Note. ***p < .001. N = 140 for *minus cognitive ability* model. Desired fit indexes: non-significant χ^2; CFI > .95; SRMR < .10 (Kline, 1998). The $\chi^2_{difference}$ test did not apply to the exploratory and baseline model comparison as they are non-hierarchical.

Table 6

Significance Tests for Indirect Effects

	Parsimonious Model		Minus Cognitive Ability	
Indirect Effect Paths	Objective AP	Subjective AP	Objective AP	Subjective AP
Cognitive ability				
via self-efficacy	.03	.07*	--	--
Stress appraisals				
via self-efficacy	-.09	-.18***	-13**	-.20***
Adaptability				
via stress appraisals and self-efficacy	.03	.06*	.05*	.07*

Note. * $p < .05$, ** $p < .01$, *** $p < .001$. Standardized coefficients reported. Kline's (1998) procedure for calculating significance tests of indirect effects was used.

efficacy to objective AP is only marginally significant: $\beta = .16$, $p = .07$ (see Figure 8). Given the high degree of technical performance reflected in objective AP task scores relative to the self- and peer-rating format used for subjective AP, cognitive ability is likely accounting for a greater degree of variance in objective AP, thereby reducing the effect of self-efficacy on objective AP. Therefore, for exploratory purposes a third model was analyzed excluding cognitive ability (see Figure 9). As expected, with the exclusion of cognitive ability, the indirect effects associated with both subjective and objective AP were significant (see Table 6). Furthermore, the exclusion of cognitive ability did not depreciate model fit. See Table 5 for a comparison of all models analyzed. Thus, the effect of the latent factor adaptability on both subjective and objective AP is fully mediated by stress appraisals and self-efficacy, as expected.

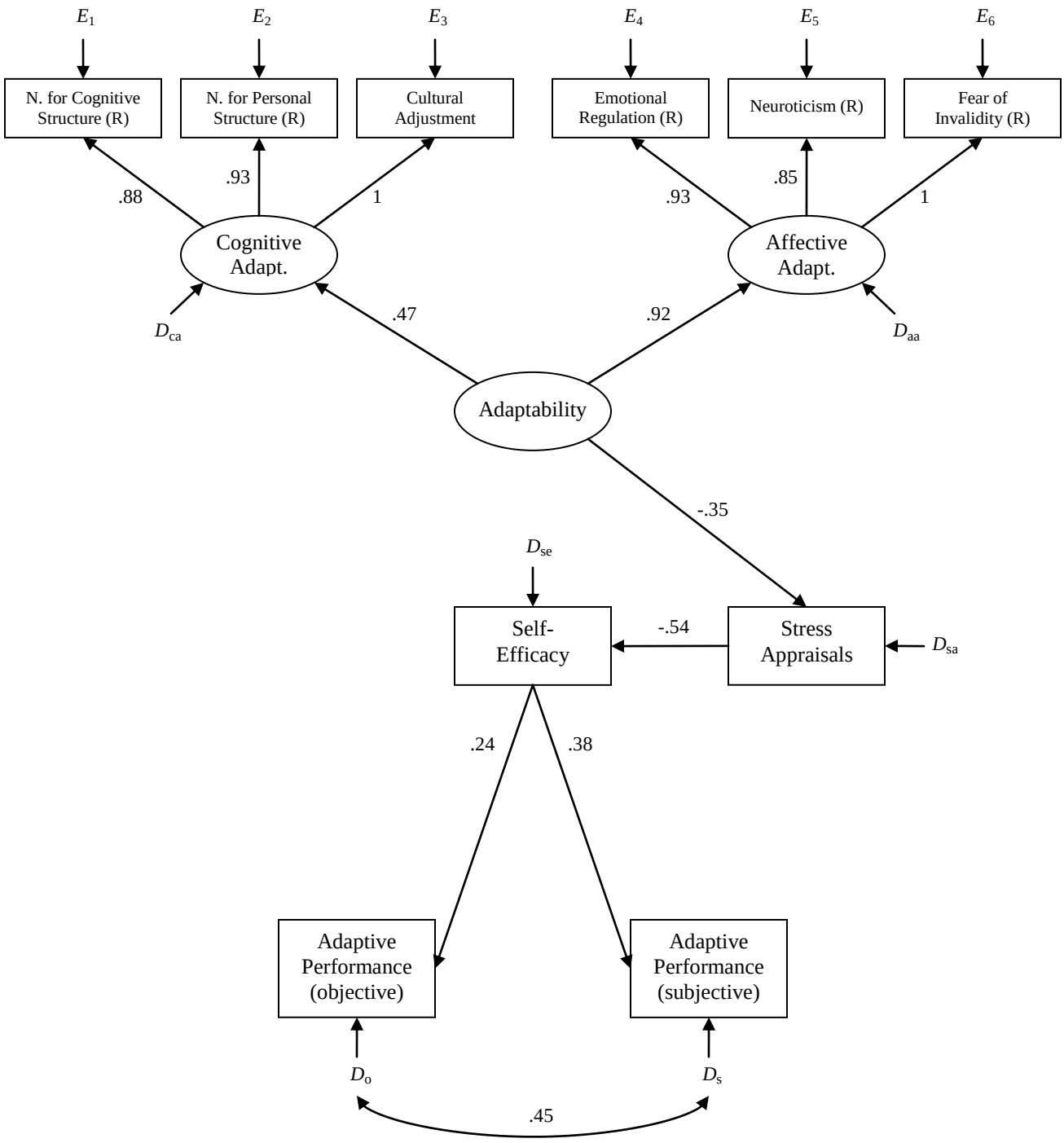

Figure 9. Results for exploratory path model of adaptive performance excluding cognitive ability. All paths are significant at $p < .01$. Sample size larger ($N = 140$) due to the exclusion of cognitive ability. Standardized regression coefficients reported. $N = 140$, $\chi^2(33) = 40.5$, $p = .17$; CFI = .98, SRMR = .06.

IV. DISCUSSION

The results of the present research offer theoretical and empirical support, clarification, and guidance in several areas: 1) marginal support for the construct validity of AP; 2) replication and extension of previous findings across divergent measurement methods for AP; 3) establishment of the predictive validity of a new variable (stress appraisals) in AP research; 4) refinement of Svensson's (2005) identification of dispositional traits indicative of an adaptive profile, and confirmation that such traits are predictive of AP; and 5) identification of a model reflecting the structural relationships and mechanisms through which adaptive performance is influenced.

Part 1

Beyond examining predictors, the present research included a commensurate focus on adaptability itself as a validated construct within the job performance domain. Several researchers (e.g., Campbell, 1990; Viswesvaran & Ones, 2000) have commented that while ample attention is given to predicting job performance, limited research attention has been directed at understanding the construct of job performance. This limitation holds true for adaptive performance. A wealth of findings have been produced using objective criterion measures in laboratory settings (e.g., Kozlowski et al, 2001; LePine, 2003), but such results tend to lack construct clarity for adaptive performance. Fortunately a few investigators have initiated research to explicate the 'construct' of adaptive performance (Allworth & Hesketh, 1999) including its dimensionality (Pulakos

et al., 2000; Griffin & Hesketh, 2001), but the majority of such research is based on subjective criterion measures in field settings. Past research has yet to examine the cross validation of these two primary criteria measures for adaptive performance. Thus, a primary contribution of the present research was the empirical examination of the convergent validity of subjective and objective measures of adaptive performance with the intent of verifying construct validity. Furthermore, this approach, in terms of measurement methods, addressed the persistent bemoaning of a lack of generalizability from laboratory to field settings.

The results of this study offered a modicum of support for the convergent validity of adaptive performance measures. Although only 27% of the variance was shared between measures, relatively similar relationship patterns and portions of variance were accounted for by the predictors. As Bommer et al. (1995) noted, such findings raise the question as to whether or not the nature of the distinction between subjective and objective measures is meaningful. If they equally predict and account for similar portions of variance, does it matter which measure is used? However, this argument brings us back to the criticism of a lack of concern for the 'construct' of job performance (Campbell, 1990; Viswesvaran & Ones, 2000). In other words, although the predictive validity for variables may be similar across criterion measures, it is important to understand what we are predicting. Indeed, job performance is the most extensively used criterion in the Industrial-Organizational Psychology literature (Viswesvaran & Ones, 2000). It is central to academics' theory construction and hypothesis testing and practitioners' desire to accurately assess performance in an effort to optimally utilize scarce resources, thus its construct validity is critical (Bommer et al., 1995).

The results of the present study leave 73% of the variance between measures unexplained. As Bommer et al. (1995) noted in their meta-analysis on the comparison of subjective and objective measures of performance, it is imperative to determine if this lack of explained variance is attributable to the differing measurement error inherent in each method, or if it is due to underlying differences in the construct being assessed. Objective and subjective measures have fundamentally different associated measurement errors (Bommer et al., 1995). As discussed in the following section, objective measures carry with them the construct validity threat of *deficiency*, whereas subjective measures include the threat of *contamination* in the form of rater bias and increased random error (Campbell, 1990). Such differences in measurement error likely contribute to the low correlation found in the present study to an extent. However, given the limited attention to the construct validity associated with objective measures of adaptive performance relative to subjective measures, underlying construct differences likely played a larger role in the low correlation reported.

Although both measures used in the present study assessed adaptive performance, which was confirmed by the results of the manipulation checks, they did so at different levels. Consistent with previous research, the objective measure captured a single quantitative aspect of adaptive performance specifically related to task duties, whereas the subjective measure was a composite of several dimensions of adaptive performance. As mentioned previously in regard to Borman and Motowidlo's (1997) distinction, the objective measures were limited to task-specific performance, whereas the subjective measures included aspects of contextual performance. As is true for most objective measures of performance (Bommer et al., 1995), although touted to be more precise

measures, the objective measures used to assess adaptive performance in past and present research capture only narrow aspects of the higher order construct of interest. Campbell (1990) noted that such assessment is inadequate as it glosses over the inherent dimensionality of most job performance constructs. In contrast, the subjective measures used capture various aspects of adaptive performance neglected by the objective measures (e.g., interpersonal and cultural adaptability), but which undeniably contribute to overall performance, especially in a multicultural team setting as was characteristic of the present study. Thus, a larger portion of the unexplained 73% of the variance is likely attributable to these underlying differences in the level of construct assessment. Future research should continue to explore the convergent validity of the measures by developing objective measures that align with Pulakos et al.'s (2000) AP dimensions. Indeed, Bommer et al (1995) noted that a strong comparison of measures requires that the same performance construct be assessed at precisely the same level.

Part 2

Considering the findings of the initial part of this study, all hypotheses examined under the second part included both subjective and objective criterion measures of adaptive performance. Although numerous predictors of adaptive performance have been identified (e.g., Griffin & Hesketh, 2003; Kozlowski et al., 2001; LePine, 2003), such research was conducted under differing views and operationalizations of adaptive performance. It was equivocal at best whether or not findings from disparate measures of adaptive performance would converge and offer the same guidance. Thus, the second part of this study sought to replicate the findings of previous research regarding predictors of adaptive performance, extend such research to include previously

unexamined predictors, and elucidate unexplored causal associations between predictors. Results regarding direct relationships (Hypotheses 1 – 5) will be discussed first, followed by a more detailed discussion of variables as they fit within the path model examined (Hypothesis 6).

A Replication of Previous Research

Although future research should continue to explore the construct validity of adaptive performance, the present research confirmed the association between the disparate measures and ensured relatively equal predictive validity for previously supported predictors. Furthermore, considering the common method variance associated with subjective AP and the self-report predictors, these correlations were likely inflated. A similar inflation likely occurred between objective AP and cognitive ability due to the high degree of technical task competence required for objective AP. Thus, all variables are likely more similar in predictive validity than the present results suggest.

Cognitive ability and personality. Following previous research, Hypothesis 1 posited that cognitive ability and various personality variables would be significantly related to adaptive performance. Consistent with previous research, cognitive ability significantly predicted both subjective AP (e.g., Allworth & Hesketh, 1999; Pulakos et al., 2002) and objective AP (e.g., LePine, 2005; LePine 2003) and explained a relatively similar portion of variance in each. Contradicting previous research (e.g., Griffin & Hesketh, 2003; Lepine et al., 2000; Pulakos et al., 2002), none of the personality variables examined were found to directly predict either subjective or objective AP. However, as explained below, indirect links were supported. Thus, partial support for the

first hypothesis was found, replicating previous research in regard to cognitive ability, but failing to find a direct relationship for personality factors.

The lack of support for personality variables is not surprising giving the equivocal findings of previous research. Although all of the Big Five personality factors are typically included, research is inconsistent regarding which variables are significantly related to adaptive performance. For example, Allworth and Hesketh (1999) examined all Big Five factors and reported none to be significantly correlated with adaptive performance, but openness and neuroticism together accounted for a marginal portion of variance in adaptive performance. Other researchers (Griffin & Hesketh, 2003; LePine et al., 2000/2003; Pulakos et al., 2002) have found relationships between of AP and openness, and Neuroticism to varying degrees. LePine et al. (2000) found a negative relationship for conscientiousness, but in an extension LePine (2003) found a significant positive relationship after separating out the 'achievement' aspect of conscientiousness. The present research addressed these equivocal findings by examining the potential of mediating effects, as discussed below.

Self-efficacy. Previous research findings have been more consistent in regard to self-efficacy's positive relationship with adaptive performance (e.g., Gist & Mitchell, 1992; Griffin & Hesketh, 2003; Kozlowski et al., 2001; Pulakos et al., 2002), as well as its incremental validity (e.g., Allworth & Hesketh, 1999). Consistent with previous research and in support of the second hypothesis, self-efficacy was found to significantly predict adaptive performance (subjective and objective) above and beyond cognitive ability and personality. The strength of this relationship and the lack of support for

personality factors highlight the potential of self-efficacy's mediating role, which was supported in this research, and is discussed below.

An Extension of Previous Research

Task requirements. Although Griffin and Hesketh (2003) found work requirements and job complexity to be related to adaptive performance, a similar relationship was not supported for task requirements as posited in Hypothesis 3. However, as discussed in depth under limitations, the within-subjects design used in the present study likely did not have sufficient power. Furthermore, future research should explore alternative assessments of situational influences.

Stress appraisals. Compelling results were found for the fourth hypothesis, establishing stress appraisals as a valid predictor of adaptive performance. Although previous research has yet to examine this association and therefore replication studies should follow, the present research found support for a direct relationship between stress appraisals and adaptive performance (subjective and objective). Results indicated that challenge appraisals were associated with higher adaptive performance whereas threat appraisals were associated with lower adaptive performance. These results are consistent with findings in regard to stress appraisal's relationship with other types of performance (Gildea et al., 2007; Lyons & Schneider, 2005; Schneider, 2004; Tomaka et al., 1993). Furthermore, as discussed below, stress appraisals played an integral role in explicating potential causal associations between other variables examined.

Adaptive profile. The direct relationships posited in the fifth hypothesis were not supported. Because Svensson et al.'s (2005) three-factor adaptive profile structure was not supported, the latent variable scores of *instability*, *adaptability*, and *need for structure*

could not be used to examine this hypothesis. Alternatively, the six indicators (need for cognitive structure, need for personal structure, fear of invalidity, emotional regulation, cultural adjustment, and neuroticism) of the latent variables were examined as predictors of AP (subjective and objective), but none shared a significant direct relationship with AP. However, as Svensson and colleagues' (2005) work did not examine the latent factors as predictors, the lack of support in the present study is not surprising. Indeed, the examination of the direct relationships posited in this hypothesis was more for exploratory purposes to ascertain if predictive validity existed. Although not empirically examined, the underlying assumption in Svensson and colleagues' (2005) study was that dispositional traits indicative of an adaptive profile would be beneficial for adaptive performance. Specific mechanisms or relationships regarding how such adaptive characteristics would influence adaptive performance were not posited by Svensson and colleagues' (2005). However, the present study empirically examined this assumption, testing adaptive dispositions direct and indirect influences on adaptive performance. Results of the present study did not support a direct relationship, but support was found for an indirect relationship. Thus, the dispositional traits identified by Svensson and colleagues (2005) are predictive of adaptive performance, albeit indirectly, through the mediating mechanisms of stress appraisals and self-efficacy.

Before discussing the details of the identified structural path model, it should be noted that the specific factor structure supported in Svensson et al.'s (2005) study was not supported in the present study. As opposed to a three-factor structure (*instability*, *adaptability*, and *need for structure*), each composed of two trait indicators, results supported a respecified second-order hierarchical structure. All six of the previously

identified indicators remained significant in the model; however, need for cognitive structure, need for personal structure, and cultural adjustment loaded on one factor, and fear of invalidity, neuroticism, and emotion regulation loaded on a second factor. These two lower-order factors, reconceptualized as *cognitive-oriented adaptability* and *affective-oriented adaptability*, were specified to load on a single higher-order factor, *general adaptability*. This model respecification not only statistically explained the data better, but considering the content of the indicators and the plethora of research referring to the cognitive and affective components of adaptive performance and performance in general (e.g., Allworth & Hesketh, 1999; Borman & Motowidlo, 1993; Gist et al., 1990), the respecification was conceptually justified.

Recalling Pulakos et al.'s (2000) definition of adaptive performance, the cognitive component relates to the *application of learning and problem solving skills*, the affective component relates to the attitudinal or emotional adjustment that is required to *cope with changing environments and task requirements*. The relevance of need for cognitive and personal structure to learning and problem solving are apparent as they both relate to cognitive structuring of information, be it for decision making or personal preference (Thompson et al., 2001). Thus, the more rigid individuals are in structuring information, the less flexible they are in problem solving and applying learning in new situations. There is also an ostensible cognitive orientation in cultural adjustment as it refers to the underlying *skills* that facilitate adaptation in the presence of differing cultures, not to culturally specific attitudes (Matsumoto et al., 2001). On the affective side, beyond the statistical evidence, fear of invalidity, neuroticism, and emotion regulation clearly relate

to the attitudinal or emotional adjustment that is necessary to cope with changing environments and task requirements.

Gist et al.'s (1990) training research offers further clarification and support for a cognitive-affective distinction. They suggested that transfer to a complex task (i.e., adaptive performance) depends on the trainee's capacity to orchestrate the generalization of knowledge and skills from the training context to the transfer task. This orchestration is a function of: (a) trait-oriented cognitive abilities, which enable the integration of training material in a manner that facilitates its application in a novel context, and (b) the ability to manage affective factors which inhibit performance. However, Gist and colleagues went a step further and identified self-efficacy as facilitative of this orchestration of cognitive and affective components in the transfer of training (i.e., adaptive performance). In other words, self-efficacy exerts a more direct influence on adaptive performance as it is the embodiment of the competence (cognitive) and resiliency (affective) needed to generalize skills in order to meet the demands faced in novel and complex situations (Bandura, 1991; Gist & Mitchell, 1992; Kozlowski, 1998; Kozlowski et al., 2001).

Structural path model. The overriding goal of the present research was to identify a structural path model for adaptive performance. The support of the posited model offers a clear delineation of the antecedents and mediating mechanisms that influence adaptive performance. Given Svensson et al.'s (2005) initial findings and the respecified measurement model of an adaptive profile statistically and theoretically supported in the present study, it is evident that individuals go into an adaptive situation with certain dispositional tendencies that are more or less 'adaptable.' What was not evident prior to

this study, was how these adaptable tendencies exerted an influence on adaptive performance. Although self-efficacy's mediating role made conceptual sense in regard to adaptive performance (Gist et al., 1990), it had not been tested empirically. However, there is empirical evidence supporting self-efficacy as a mediating variable relative to other types of performance (Mathieu, Martineau, & Tannenbaum, 1993). As expected and in support of Hypothesis 6, self-efficacy ultimately mediated the relationship between all other variables examined and adaptive performance.

Surprisingly, a significant relationship was not found between adaptability and self-efficacy. Considering literature where stress appraisals serve a mediating role regarding other types of performance (e.g., Lyons & Schneider, 2005; Schneider, 2004), stress appraisals in the present study were remodeled as a distal mediator of adaptive performance. Stress appraisals, construed as threat and challenge appraisals, are based on an evaluation of whether or not one believes his/her skills and abilities to be commensurate with the requirements of the task or situation. Given that the evaluative component is based on a comparison of the self with the task at hand, the present research posited stress appraisals would operate as a causal mechanism, mediating the influence of dispositional traits on adaptive performance. The posited mediated relationship was supported; the more adaptable individuals' dispositional tendencies, the less likely they will appraise the task as a threat, thereby increasing adaptive performance. Offering further clarification of structural relationships, self-efficacy was posited as a proximal mediator. Although stress appraisals are task specific, self-efficacy as measured in the present research was specific to an individual's belief in coping with situations that require a high degree of adaptability. These mediated relationships made conceptual

sense considering the continuum of proximity associated with the variables and behavior (i.e., adaptive performance). To clarify, moving from distal influences to proximal influences on adaptive performance, the latent factor of adaptability captures dispositional characteristics (distal), stress appraisals are task specific capturing relationships with *general* performance, and self-efficacy (proximal) as measured in the present study is specific to beliefs regarding *adaptive* performance. These mediated relationships were indeed supported in the present study, and served to explicate the mechanisms through which adaptability exerts an effect on adaptive performance.

Implications

The findings of this study offer several theoretical and practical implications. Results associated with the first part of the study serve as a warning to researchers and practitioners that the construct validity of adaptive performance has yet to be fully established. The lack of strong convergent validity for the two foremost measurement methods suggests clarification and refinement of the construct is needed. Although equal predictability was found, it is unclear whether such results were a function of the substitutability of subjective and objective measures of AP, or a function of chance where two otherwise unrelated variables are predictive of a third (Bommer et al., 1995). Further research is needed to make such a distinction. Given that concern with adaptive performance as an aspect of the job performance domain is relatively new, researchers have the unique opportunity to heed Campbell's (1990) criticism and establish the validity of the adaptive performance construct prior to the explosion of research examining its predictors. Moreover, with the research chasm between individual difference and training approaches highlighted in the present research, future research is

needed that adopts a coherent I-P-O framework that unifies individual differences with the process outcomes of training.

These initial results also suggested that previous research results should be interpreted cautiously in that generalizations may be limited to aspects of adaptive performance captured by the particular measure used. As Bommer et al. (1995) noted in regard to performance assessment in general, you only need to look at authors' conclusions to see that they are intended to generalize to a broad performance construct, irrespective of measurement method used. The present study overcame this limitation in generalizability by including both subjective and objective measures.

A plausible distinction that warrants further research given the present findings resembles Borman and Motowidlo's (1993) distinction between task (technical) and contextual performance. Although Allworth and Hesketh (1999) empirically established adaptive performance as unique component of job performance relative to task and contextual performance, a degree of similarity is likely (see Figure 1) in that there may also be contextual and task related aspects of adaptive performance. The present findings indicated a stronger relationship between cognitive ability and objective AP (task scores) relative to subjective AP, whereas the reverse was true for affect or personality related variables. Both subjective and objective measures captured adaptive performance, however Pulakos et al.'s (2000) dimensions fall more on the contextual side (i.e., beyond quantifiable task activities), and objective measures clearly capture the quantifiable task related activities that are performed in a novel or complex situation. Similar to Borman and Motowidlo's (1993) argument, the contextual aspects of adaptive performance are often in service of the specific task related aspects of adaptive performance.

Given this distinction, researchers and practitioners should consider the type of adaptive performance of interest to determine whether results generated under subjective or objective measures should be used. For example, if the goal is to predict sales (strongly quantitative) in ever changing situations, then objective measures would be appropriate. On the other hand, if higher-order amorphous aspects of adaptive performance are important (e.g., multicultural coalition teams), Pulakos et al.'s (2000) dimensions would be more appropriate. Furthermore, the applicability of each dimension will vary across jobs, with certain dimensions affording greater generalizability than other dimensions. For example, demonstrating interpersonal adaptability is an important aspect of numerous jobs, whereas handling crisis situations is not.

Beyond the caution to practitioners regarding which research to follow, the present research offers several additional practical implications. The support for the predictive validity of Svensson et al.'s (2005) adaptive profile of dispositional tendencies is useful for selection and placement purposes. For example, the formation of multicultural coalition teams has become the standard in business and governments around the world (Connaughton & Shuffler, 2007; Ilgen & Pulakos, 1999). The adaptive profile information could be used to identify those most likely to perform well in such teams, especially in turbulent environments such as military settings. Supplementing selection based on dispositional tendencies, training interventions can be targeted at improving adaptive performance. Specifically, the path model supported in the present research offers stress appraisals and self-efficacy as targets for training interventions.

Stress appraisals and self-efficacy are malleable beliefs about the task or situation at hand. In regard to self-efficacy, individuals must first have confidence in their ability

to adapt before they can perform adaptively (Griffin & Hesketh, 2003; Kozlowski et al., 2001). As self-efficacy is not considered a generalized trait (Bandura, 1991), this confidence can be developed through training or from exposure to previous successful experiences in dealing with change. The same holds for stress appraisals; the more training or exposure one has to fluctuating task environments, the less likely they will be construed as a threat. Furthermore, Gist et al. (1990) provided empirical evidence indicating that augmenting content approaches to skill training with process oriented self-management training (e.g., stress appraisals and self-efficacy) facilitates the orchestration process of combining cognitive and affective factors in the generalization of adaptive behavior to new settings. Kozlowski et al. (1999; 2001) have suggested several such self-management training techniques that enhance adaptive performance through the improvement of self-efficacy beliefs: advance organizers, analogies, guided discovery, error-based training, metacognitive instruction, learner control, and self-sequenced mastery goals. In addition to and related to the improvement of self-efficacy, these training techniques also facilitate other learning outcomes such as deep comprehension, flexible knowledge structures, self-regulatory and metacognitive skills. Although empirical evidence is needed, given such learning outcomes in training, individuals will also be less likely to appraise the situation as a threat as they will have developed the requisite abilities to cope with the changing situation.

Limitations and Future Research

Although a primary focus was to address limitations in previous research, namely the measurement issues associated with adaptive performance, the present research had its own limitations. First, the data collection was performed in a laboratory setting, using

a laboratory task. Research is needed that confirms generalization of results to a field setting. Given that the goal is to understand and predict an aspect of 'job' performance, results should be confirmed for actual jobs where adaptive performance is imperative (e.g., emergency response, multicultural teams). Furthermore, generalization of results to a field setting is particularly important when considering the relevance to multicultural adaptation. Matsumoto (2006) noted that culture is likely to have a greater influence on self-report data as opposed to actual behavior.

A second limitation was the restricted assessment of situational influences on adaptive performance. The moderating effects of task requirements would be more appropriately examined using a between-subjects design, as opposed to the within-subjects design used in the present study. Furthermore, although it was beyond the scope of this study, future research should explore additional situational influences (e.g., technology and organizational climate) as potential moderators of adaptive performance. If research is to be of use in the applied world, researchers cannot overlook one of the most imposing aspects of work today, technology. That is, to ensure generalizability of research results from the lab to the 'real' world, future research should examine how adaptive performance of individuals operates within the context of technology. Furthermore, the implementation of the technology itself is a source imposing change and therefore requiring adaptation. In addition to a research program that identifies general predictors of adaptive performance, research should be focused on also identifying predictors specific to complex sociotechnical systems as this is an area where adaptability is crucial. Akin to the TWA notion of 'fit' between the employee and the work environment discussed previously, Hesketh and Neal (1999) proposed the notion of

person X technology fit, indicating that certain individuals may benefit from technology more than others. Such 'fit' is likely to be essential in complex sociotechnical systems, and adaptive performance might offer the foundation for understanding and predicting the fit. That is, technology and adaptive performance both play a substantial role in complex sociotechnical systems, and the more 'adaptable' workers are, the greater their likelihood of benefiting from and adapting to the technology.

Organizational climate is another potential moderator of adaptive performance that future research should examine. Broadly speaking, organizational climate refers to an extensive class of organizational and perceptual variables that affect individuals' behavior in organizations (Glick, 1985). More precisely, Reichers and Schneider (1990) define climate as the shared perceptions of organizational practices, policies, and procedures coalescing in a general view of "the way things are" in the organization. For a more detailed definition at the individual level, climate is the set of attitudes and expectancies one holds that describe an organization's static characteristics as well as behavior-outcome contingencies (Bates & Khasawneh, 2005). This individual-based definition makes the situational influence on behavior explicit by asserting behavior-outcome contingencies. That is, climate perceptions establish the outcomes or rewards individuals believe they will receive from the organization for a given behavior, therefore positively or negatively reinforcing the behavior. Thus, organizational climate as a situational influence on behavior is likely to play a significant role in reinforcing adaptive performance. However, the construct of organizational climate is inherently multidimensional, which can create measurement complications. Glick (1985) suggested an approach to dealing with measurement complications by limiting the climate

dimensions assessed to those dimensions which are associated with the criterion of interest. The organizational climate dimension of *learning* or *innovation* is likely the most relevant to adaptive performance.

A climate for learning or innovation focuses on organizational variables and strategies that will enhance adaptability and flexibility of the organization (Bates & Khasawneh, 2005). Akin to the notion of continuous learning (London & Mone, 1999), such a climate enables an organization to adapt to the dynamics of a changing environment (Bates & Khasawneh, 2005). An organizational learning climate and an organizational emphasis on the adaptive performance of its employees clearly converge on the same goal: adaptation. A useful conceptualization would be to view adaptive performance as subsumed under an organizational learning climate. In other words, adaptive performance of individuals or teams is one organizationally relevant variable that can be facilitated in order to support the adaptability of the *organization* as a whole. This view aligns with earlier discussion regarding the importance of a systems view and acknowledging the roles of differing levels within an organization. In summary, organizations that instill a learning climate will be more likely to encourage and reward adaptive performance. In turn, individuals will perceive this behavior-outcome contingency, reinforcing the display of adaptive performance behaviors. Again, although it was beyond the scope of this study, future research should explore the moderating effects of an innovative organizational climate on adaptive performance.

As a final limitation, the data would have been more appropriately analyzed using multilevel modeling considering the team setting of the study. Due to loss of data associated with computer malfunctions, the sample size was not large enough to provide

the power required for multilevel modeling. However, results indicated a significant portion of the variance in subjective and objective AP was attributable to the team level, ICC = .23 and ICC = .27, respectively. That is, the observations across teams were not completely independent and results should be interpreted cautiously given the violation of this assumption. Given the relevance of team settings to adaptive performance, future research efforts should replicate the present results using a larger sample size, permitting multilevel modeling.

Conclusion

In summary, the findings verify the convergence of a path model of predictors for disparate measures of adaptive performance, thereby providing clear and consistent guidance for selection and training. Furthermore, support was provided for dispositional traits identified as a latent adaptive profile (Svensson et al., 2005), which in turn predict adaptive performance through the mediating mechanisms of stress appraisals and self-efficacy. Several new research directions were explored and supported in the present research: the combined examination of subjective and objective measures of adaptive performance, stress appraisals examined as a predictor/mediator of adaptive performance, self-efficacy examined as a mediator of adaptive performance, and finally, the relationships between all variables delineated in a path model predicting adaptive performance. As this was a preliminary examination of new research directions, given the promising results, future research is needed to further explore, confirm, and extend the present findings. Above all, the findings of the present study should be interpreted as an appeal to future researchers for the desperate need of a sound theory to support the adaptive performance construct. Until an overarching theory of adaptive performance is

established that conceptually, theoretically, and empirically unifies the objective and subjective approaches and the aspects of adaptive performance they are intended to capture, the conclusions drawn from research will continue to be truncated.

Appendix A

Pulakos and colleagues' (2000) Adaptive Job Performance Dimensions under the Theory of Work Adjustment Framework (adapted from Griffin & Hesketh, 2003)

Dimension & TWA	Dimension definition
Proactive Handling emergencies or crisis situations	Reacting with appropriate and proper urgency in life threatening, dangerous, or emergency situations; quickly analyzing options for dealing with danger or crises and their implications; making split-second decisions based on clear and focused thinking; maintaining emotional control and objectivity while keeping focused on the situation at hand; stepping up to take action and handle danger or emergencies as necessary and appropriate.
Proactive Solving problems creatively	Employing unique types of analyses and generating new, innovative ideas in complex areas; turning problems upside-down and inside-out to find fresh, new approaches; integrating seemingly unrelated information and developing creative solutions; entertaining wide-ranging possibilities others may miss, thinking outside the given parameters to see if there is a more effective approach; developing innovative methods of obtaining or using resources when insufficient resources are available to do the job.
Tolerant Handling work stress	Remaining composed and cool when faced with difficult circumstances or a highly demanding workload or schedule; not overreacting to unexpected news or situations; managing frustration well by directing effort to constructive solutions rather than blaming others; demonstrating resilience and the highest levels of professionalism in stressful circumstances; acting as a calming and settling influence to whom others look for guidance.
Tolerant Dealing with uncertain and unpredictable work situations	Taking effective action when necessary without having to know the total picture or have all the facts at hand; readily and easily changing gears in response to unpredictable or unexpected events and circumstances; effectively adjusting plans, goals, actions, or priorities to deal with changing situations; imposing structure for self and others that provide as much focus as possible in dynamic situations; not needing things to be black and white; refusing to be paralyzed by uncertainty or ambiguity.
Reactive Learning work tasks, technologies, and procedure	Demonstrating enthusiasm for learning new approaches and technologies for conducting work; doing what is necessary to keep knowledge and skills current; quickly and proficiently learning new methods or how to perform previously unlearned tasks; adjusting to new work processes and procedures; anticipating changes in the work demands and searching for and participating in assignments or training that will prepare self for these changes; taking action to improve work performance deficiencies.
Reactive Demonstrating interpersonal adaptability	Being flexible and open-minded when dealing with others; listening to and considering others' viewpoints and opinions and altering own opinion when it is appropriate to do so; being open and accepting of negative or developmental feedback regarding work; working well and developing effective relationships with highly diverse personalities; demonstrating keen insight of others' behavior and tailoring own behavior to persuade, influence, or work more effectively with them.
Reactive Demonstrating cultural adaptability	Taking action to learn about and understand the climate, orientation, needs and values of other groups, organizations, or cultures; integrating well into and being comfortable with different values, customs, and cultures; willingly adjusting behavior or appearance as necessary to comply with or show respect for others' values and customs; understanding the implications of one's actions and adjusting approach to maintain positive relationships with other groups, organizations, or cultures.
Reactive Physically oriented adaptability	Adjusting to challenging environmental states such as extreme heat, humidity, cold, or dirtiness; frequently pushing self physically to complete strenuous or demanding tasks; adjusting weight and muscular strength or becoming proficient in performing physical tasks as necessary for the job.

Appendix B

CAPS Screen Display
(passenger service station currently represented)

V. REFERENCES

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