ADAPTABILITY AND DECISION MAKING UNDER STRESS IN THE WORKPLACE

by

Katie B. Poole

A thesis submitted in partial fulfillment
of the requirements for the degree of
Master of Arts in Psychology

Middle Tennessee State University
August 2018

Thesis Committee:

Dr. Michael Hein, Chair

Dr. Glenn Littlepage

Dr. Alexander Jackson

ACKNOWLEDGEMENTS

I would like to thank those who challenged me and supported me along the path to completing my thesis. I would like to thank my committee chair, Dr. Michael Hein. Thank you for your persistence, guidance, and above all else hope in this process even when our direction did not go as planned. Your knowledge and kindness are hard to match, and I am forever thankful for you. I would also like to thank my committee member, Dr. Glenn Littlepage, your timely advice, encouragement, and keen eye was a much-needed contribution. I would like to thank my critical reader, Dr. Alex Jackson. Your statistical and scientific knowledge as well as your prompt inspiration and enthusiasm were critical to the completion of my thesis. I would like to thank my faithful Chihuahua, Mylie, who sat in my lap, patiently watched me type every word, and forced me to step outside several times a day. I'd like to thank my friends and family, who love me and stayed by my side despite my antisocial phase. Thank you to my parents, who graciously allowed me to pursue my dreams and supported me through every step. Thank you, William, for being my person and for always knowing what to say. Thank you to my cohort for everything. It was the best of times and it was the worst of times. A special thanks to Jessi Pope. I will always be indebted to you. Your kind soul and selflessness helped me through graduate school more than you will probably ever realize. Above all else, I would like to thank my savior Jesus Christ who has showed me that through him, so many things are made possible.

ABSTRACT

The following research focuses on the relationship between individual adaptability and performance while taking into account the potential mediating effects of perceptions of decision making under stress. The effects of time (experience) were also included in the experiment. Participants for this study consisted of individuals in a flight operations center simulator. Participants work together in a team to resolve issues and make decisions in order to effectively operate the virtual airlines. As participants' individual adaptability increased, their perceptions of ability to make decisions while under stress also increased. A significant interaction was found between decision making under stress and time when predicting individual performance, as well as individual adaptability and time when predicting individual performance. These relationships were stronger at time 2 than at time 1. When testing the model in its entirety, results indicated that time significantly interacts with participants' individual adaptability and perceptions of decision making under stress to predict performance. Future research should explore other factors that may interact with or moderate the relationship between individual adaptability and performance as well as perceptions of decision making under stress and performance. Future studies should also continue to consider the variable of time or experience and the effect it has on these relationships.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

CHAPTER I: INTRODUCTION

In various occupations, experts are often faced with novel scenarios where decisions need to be made under time pressure. In these naturalistic career settings, employees are frequently assessing the environment and making decisions under ambiguous circumstances. These decisions, in addition to affecting many imperative organizational outcomes, can even determine life or death for the individuals in which they impact. To exemplify, in 2003, a charter fishing boat capsized. This killed 10 of the 17 passengers along with the captain. It was determined that the cause of the incident was most likely "the decision of the master (i.e., the captain) to attempt to cross Tillamook Bay bar despite the hazardous sea state that existed at the time" (National Transportation Safety Board, 2005, p. 56). Another tragic accident due to poor decision making while in a novel and high-stake situation happened in July 1988 when U.S. Navy members were ordered from their captain to shoot down a civilian Iranian Airbus A-300, which they had mistook for a F-14A Tomcat Fighter (Department of Defense, 1988). This incident in history sparked much research in the decision making under stress realm in order to mitigate the effects of stress (Cannon-Bowers & Salas, 1998). On a less severe scale, many employees in organizations are required to adapt to organizational changes (i.e., technology), reach demanding goals, and make decisions that could affect the future success of the companies in which they work. For instance, according to USA Today (2014), Kodak at one time was the first company to develop the technology for what would be considered today, a cell phone. The key executives of Kodak decided to put aside the new technology, fearing it would be a threat to sales for their other products (Becker, 2014).

The ambiguity, time pressure, and other stressful circumstances that are characterized in work situations as the ones described have often been referred to as naturalistic decision making scenarios (e.g., Zsambok & Klein, 1997). In an attempt to understand why many individuals do not make sound decisions in stressful situations, much research has been conducted on decision making under stress (e.g., Starck & Brand, 2012). However, though many organizations strive to select employees who demonstrate adaptive behaviors in order to maintain a competitive advantage (Lawler & Worley, 2006), research on individual differences, like adaptability, and their effects on performance in naturalistic career settings is lacking (Beach and Mitchell, 1998; Mohammed and Schwall, 2009; Shiloh, Koren, & Zaykay, 2001).

The purpose of the following study is to observe the relationship between individual adaptability and performance in a stressful work-like environment while taking into account potential mediating effects from individual perceptions of ability to make decisions while under stress. These relationships will be observed at different points in time in order to see if experience (or time) has an effect on the potential relationships. In order to obtain similar results as would be expected in a naturalistic work environment, the present study will be utilizing simulations of a work environment that the primary researcher deems as stress - inducing.

What follows is a review of predominant existing literature on individual adaptability as well as its proposed relationship with performance. Models for adaptability will be examined, as well as the model for adaptability that will be utilized in the present study. Subsequent, the potential effects of experience with the variables of interest (individual adaptability perceptions, decision making under stress perceptions,

and individual performance) will be discussed. Lastly, an explanation for the current study's model will be presented.

Individual Adaptability

There is a considerable amount of research that aims to define and explain adaptability and which characteristics make up an adaptable person (e.g., Boylan & Turner, 2017; Ployhart & Bliese 2006; Pulakos, Arad, Donovan, & Plamondon 2000; Junt, Shoss, & Huang 2014). Though there is currently no consensus for a definition of adaptability, most of the related literature explains that it involves a change in behavior, and how people deal with a change in the environment. For the purpose of this study, individual adaptability will be defined as it is defined by Ployhart and Bliese (2006), "an individual's ability, skill, disposition, willingness, and/or motivation, to change or fit different task, social, and environmental features" (p.13).

Models of Individual Adaptability

Campbell, McCloy, Oppler, and Sager (1993) (as cited in Schmitt & Borman, 1993) created a model of job performance which encompassed eight dimensions that generalized across various occupations. Among these dimensions were job-specific task proficiency, non-job specific- task proficiency, written and oral communication, demonstrating effort, maintaining performance discipline, maintaining peer and team performance, supervision/leadership, and management/administration. After proposing this model, Campbell and colleagues (1993) (as cited in Schmitt & Borman, 1993) suggested that there may be an additional dimension of job performance that encompasses how successful employees are at adapting to changes in the workplace.

Campbell et al., (1993) (as cited in Shmitt & Borman, 1993) believed this to be an important addition to their previously proposed model.

Since this time, several models have been constructed in an effort to conceptualize adaptability. A model similar to the one previously mentioned and widely discussed among researchers is a model of adaptive performance explained by Pulakos, Arad, Donovan, and Plamondon (2000). Pulakos et al. (2000) conducted two studies in an effort to create their model of adaptive performance. The first study involved analyzing the content of approximately 1,000 critical incidents that surfaced from 21 various jobs. In the second study, the proposed taxonomy referred to as the "Job Adaptability Inventory" was developed and implemented over 24 diverse jobs in order to examine the taxonomy. Pulakos et al. (2000) expressed that the eight-dimension taxonomy received much support within these two studies. The taxonomy consisted of 1) Handling Emergencies or Crises, 2) Handling Work Stress, 3) Solving Problems Creatively, 4) Dealing with Uncertain and Unpredictable Situations, 5) Learning Work Tasks, Technologies, and Procedures, 6) Demonstrating Interpersonal Adaptability, 7) Demonstrating Cultural Adaptability, and 8) Demonstrating Physical Adaptability. See Table 1 for definitions of each dimension.

In an attempt to expound upon this model, Pulakos, Schmitt, Dorsey, Arad, Borman and Hedge (2002) created a study that continued with the work of Pulakos et al. (2000). Results indicated support for the 8-dimension taxonomy and the addition of cognitive ability, personality, and the new adaptive performance dimensions (Pulakos et al., 2002). However, when adaptive performance among subjects was rated by their supervisors, a one-factor model was found to have the best fit.

Ployhart and Bliese (2006) also observed the Job Adaptability Inventory proposed by Pulakos and colleagues and constructed a promising model termed the I-ADAPT Model. The current study will utilize this model.

Ployhart and Bliese Theory of Individual Adaptability. The definition of adaptability presented by Ployhart and Bliese (2006) builds from past research by conceptualizing adaptability as a reasonably stable individual difference that influences how a person perceives and reacts to various situations. Ployhart and Bliese (2006) recognize that adaptability not only takes place when there is a situational or environmental change (reactive), but that it also can take place when the environment has not changed; however, the individual notices their behavior is not leading to desired outcomes so a proactive change is made.

Ployhart and Bliese (2006) explain that their model for individual adaptability is a different construct than adaptive performance. This distinction is made considering these researchers conceptualize individual adaptability as a concept made up of various knowledge, skills, abilities, and other characteristics (KSAOs) rather than specifically task performance. Adaptability from this point of view is considered to be a characteristic that encompasses various KSAOs that contribute to individual adaptability rather than a single trait or skill. This definition is broad, containing eight lower-order latent dimensions (e.g., crisis and work stress), to take into account any subtle distinctions between environmental effects and self-adjustments.

Ployhart and Bliese (2006) have presented their model in graphical form (See Figure 1). The model suggests that an individual's knowledge skills and abilities (i.e., cognitive ability, personality, and physical ability) predict individual adaptability.

Individual adaptability subsequently predicts forms of performance such as task, contextual, and counterproductive through several mediating processes (i.e., situation perception and appraisal, self-regulation and coping) as well as being moderated by environmental adaptability requirements. From this model, Ployhart and Bliese (2006) created a 55-item measure which will be utilized in the present study. See Appendix E.

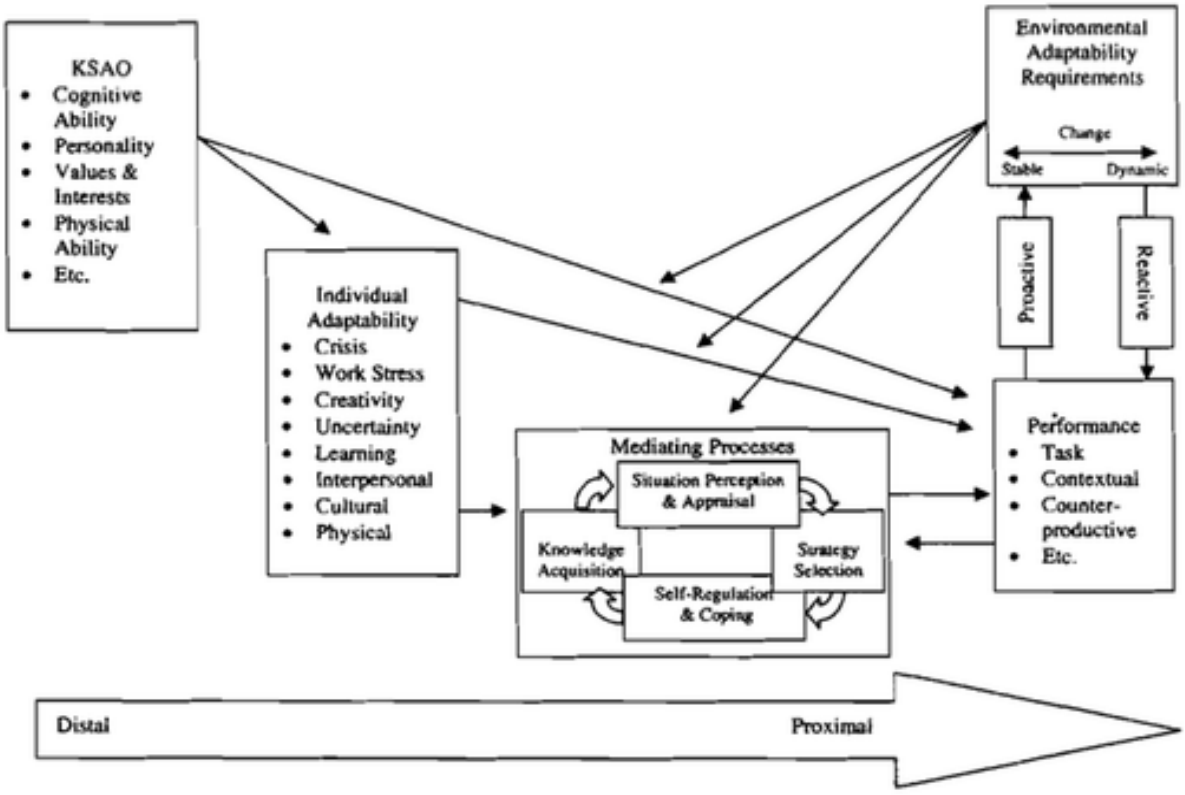

Figure 1. Individual Adaptability (I-ADAPT) Model. Reprinted from *Understanding Adaptability: A Prerequisite for Effective Performance Within Complex Environments* (p. 16), by C. S Burke, L. G. Pierce, & E. Salas, 2006, Kidlington, Oxford: Elsevier Ltd. Copyright 2008 by Elsevier Ltd.

Individual Adaptability and Performance

Though Ployhart and Bliese (2006) have created a measure that could appear to be promising in assessing individual adaptability, the often-common consensus that a reliable measure of individual adaptability does not exist has resulted in a lack of studies examining the relationship between individual adaptability and performance (Chan, 2000). However, many leaders in organizations still believe that individuals who are high in adaptability perform better compared to those who are not. Furthermore, because technology is consistently changing and being invented for various uses, organizations are seeking out people who are going to be able to adapt and learn to use new technology easily (Huang, Ryan, Zabel, & Palmer, 2014). Likewise, adaptability is a hot topic in the workforce considering many companies are globalizing and workers who can adapt to various cultures can provide organizations with a competitive advantage (e.g., Lawler & Worley, 2006). Due to the high demand for adaptable workers, it is easy to assume that many leaders and managers believe that adaptability, however it may be defined, influences job performance.

Though research that utilizes a validated measure of individual adaptability is scarce, research related to the topic of individual adaptability and performance does exist. For example, while studying organizational careers of professionals, Raelin (1984) suggested that change or conflict within an organization causes deviance or adaptability among individuals to take place. His model advocates that adaptive behaviors are desired at the individual and organizational level and that adaptive individuals are more satisfied with their work, are less likely to quit their job or demonstrate absenteeism, and are overall better performers on the job. Denison et al. (2006) also expressed the desire for

individual adaptability at a broader organizational level. Denison and colleagues (2006) developed and empirically supported a theory for organizational culture and effectiveness which encompasses four cultural traits found to be positively related to organizational performance, one of which is adaptability.

Not only do those who observe employee performance believe that employees who are adaptive perform better, but the employees themselves have been found to report this pattern as well when rating their own behaviors. To exemplify, in a study assessing managers vs. employees' perceptions of adaptability, a five item self-report measure was used to measure adaptability among employees (Parent & Levitt, 2009). Parent and Levitt (2009) hypothesized that individuals who reported that they have better adaptability would also report that they are higher performers, and that managers who reported that an employee has better adaptability would also rate the same employee highly on performance. Results revealed a positive relationship between adaptability and performance for both the employee and manager's ratings (Parent & Levitt, 2009). It is interesting to note; however, that Parent and Levitt (2009) also hypothesized that participants' perceptions of their adaptability and performance would be higher than their managers' perceptions. This hypothesis was supported.

As demonstrated through the literature, adaptability at both the individual and organizational level is often described as being related to performance. The I-ADAPT model proposed by Ployhart and Bliese (Ployhart & Bliese, 2006) also predicts that individual adaptability will influence performance. This is demonstrated in the graphical form of their model. See Figure 1. The review of this literature lead to the present study's first hypothesis. Hypothesis one proposes that individual perceptions of adaptability (as

measured by the I-ADAPT) will have a positive correlation with individuals' performance. This proposed relationship led to the desire to also review existing literature on the relationship between individual perceptions of adaptability and individual perceptions of ability to make decisions while under stress.

Perceptions of Ability to Make Decisions Under Stress (DMUS) and Adaptability

Individual adaptability is a relatively stable individual difference (Ployhart & Bliese, 2006; Pulakos et al., 2000; Baard, Rench, & Kozlowski, 2014). According to the I-ADAPT model proposed by Ployhart and Bliese (2006), individual adaptability will influence individuals' perceptions. Based on the I-ADAPT model, this could include perceptions of a specific situation and whether it is challenging versus stressful or stable versus changing. The Decision Making Under Stress Scale is a measure of perceptions, but perceptions relative to one's ability to make decisions while under stress. Both variables seem to have a self-efficacy component that is task specific. Perhaps people who believe they are able to adapt to certain situations possess similar characteristics to those who perceive they can make decisions while under stress. For example, Martin, Nejad, Colmar, and Liem (2013) explain that people who are low in neuroticism are more adaptable. Likewise, scholars such as Byrne, Silasi-Mansat, and Worthy (2014) explain that this characteristic is also important for decision making. As mentioned previously, the I-ADAPT model has eight dimensions. Some of these dimensions, such as handling work stress, exemplifies behaviors of individuals that one might expect would be able to not only adapt to stressful circumstances, but also make decisions while under stress.

Though it was discovered there is a lack of research on this area of interest, existing past research appears to suggest that individuals who perceive they can make

decisions while under stress may be similar to individuals who believe they can be adaptive. This leads to the present study's second hypothesis that perceptions of individual adaptability (I-ADAPT) will be positively correlated with perceptions of individual decision making under stress. After creating the first two hypotheses from an extensive review of literature, the primary researcher found it beneficial to also research the potential relationship between decision making under stress and performance.

Decision Making Under Stress and Performance

As mentioned previously, the primary researcher was specifically interested in observing the concept of participants' perceptions of their ability to make decisions while under stress. Because this entails an individual's perception or belief about their ability to perform, some scholars could consider this variable to be similar to self-efficacy (i.e., Bandura, 1997). Though there is a lack of research on the relationship between perceptions of decision making ability while under stress and performance, much research exists that examines the connection between self-efficacy and performance.

Bandura (1994) defines perceived self-efficacy as "people's beliefs about their capabilities to produce designated levels of performance that exercise influence over events that affect their lives" (p.1). Bandura (1994) explains that people with a strong sense of self-efficacy believe they will have control over a threatening situation. A high sense of self-efficacy has been found to positively affect performance in areas related to sports (i.e., Baretta, Greco, & Steca, 2017; Wright, O'Halloran, & Stukas, 2016), music (Hewitt, (n.d); McPherson & McCormick, 2006; Ritchie & Williamon, 2012), academia (e.g., Drago, Rheinheimer, & Detweiler, 2018; Hwang, Choi, Lee, Culver, & Hutchison 2016; Talsma, Schüz, Norris, & Schwarzer, 2018), and work (e.g., Lisbona, Palaci,

Salanova, & Frese, 2018; Song, Bae, Chai, & Kim, 2018). Though studies have continuously indicated the positive relationship between high self-efficacy and performance, scholars also debate that a high sense of self efficacy can also negatively affect performance (Vancouver, Thompson, Tischner, & Putka). Despite the consideration on how self-efficacy effects performance, the current body of research has a relatively common consensus that these two variables are correlated.

Though the present study's measure of perceptions of ability to make decisions while under stress seems similar to general self-efficacy, it is very task specific. The I-ADAPT model proposes that an individual's ability to adapt determines their performance outcomes. As mentioned previously, the behaviors demonstrated in the I-ADAPT model's eight latent dimensions of adaptability are very similar to behaviors one could expect to see in individuals who are able to make decisions while under stress. Thus, this observation lead to the current study's third research hypothesis. The primary researcher proposes that participants' perceptions of their ability to make decision while under stress will have a positive relationship with their individual performance.

After observing the proposed relationships and current hypotheses, the current study's model began to be constructed. The I-ADAPT model (Ployhart & Bliese, 2006) proposes that individual adaptability effects performance, but that it is mediated by several processes such as situation perception and appraisal. Similarly, Burke (2006) in an effort to define team adaptability created an input-throughput-output model that proposes a nomological network of relations which make up team adaptation. Like the I-ADAPT model (Ployhart and Bliese, 2006), it proposes that this form of adaptability is influenced by mediating processes such as an individual's perceptions or assessments of a

situation. Currently, the present study's hypotheses assess the relationship between individual adaptability and individual performance, individual adaptability and perceptions of decision making under stress, and perceptions of decision making under stress and individual performance. With the I-ADAPT model in mind and its demonstration of potential mediating processes between individual adaptability and performance outcomes, hypothesis four was generated. Hypothesis four states that the relationship between individual adaptability and performance will be mediated by perceptions of decision making under stress.

Experience

A final component of the current study is to consider the effects of time or experience on the proposed relationship between individual adaptability, decision making under stress, and performance. Pope and Littlepage (2016) conducted a study with senior aerospace majors who were enrolled in a capstone lab that served as a virtual airline. The current study will use the same environmental setting. The purpose of Pope and Littlepage's (2016) study was to examine the relationship between self–rated team and individual adaptive capacity as well as the progression of these constructs throughout the semester. Their results determined that individual and team adaptability were positively correlated at the individual level, but still were representative of two separate constructs. Additionally, individual adaptability increased as team level adaptability increased throughout the semester. This indicates that time potentially played a role in the relationship between team adaptability and individual adaptability such that with time, the relationship got stronger.

Based on research conducted on schemas, it is likely that the familiarity of situations similar to those an individual has been in previously can affect how the individual responds to the situation (Plant & Stanton, 2013). For example, if an individual has been in a flight operation simulation before and they have previous knowledge to refer to for how to respond to the situation, they are likely to refer to that knowledge. Also, new experiences can add to or change an individual's perception of what they encounter (Zsambok & Klein, 1997). Thus, it is expected that time/experience will affect the relationships proposed in our model so that the relationships will change with time. This leads to the following research questions. These findings lead to the following research questions.

Research Question 1. Will the relationship between individual perceptions of individual adaptability and perceptions of ability to make decisions while under stress change with experience?

Research Question 2. Will the relationship between individual perceptions of ability to make decisions while under stress and individual performance change with experience?

Research Question 3. Will the relationship between individual perceptions of adaptability and individual performance change with experience? See Table 2 for a visual overview of the hypotheses and research questions.

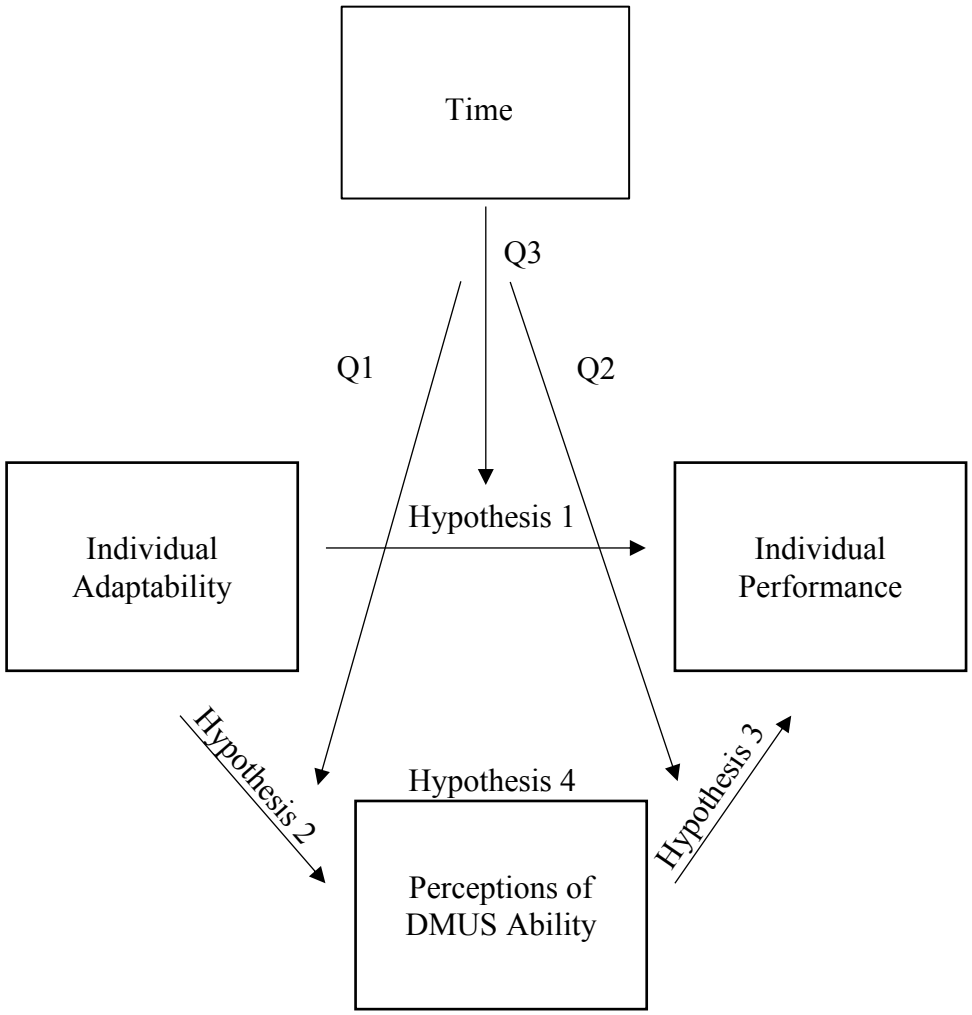

Figure 2. The Proposed Current Study's Model.

CHAPTER II: METHODOLOGY

Participants

For the present study, participants consisted of 187 students who were enrolled in an aerospace senior capstone lab at a Southeastern university. These students were divided up into 19 teams. Students enrolled in this lab participated in three flight operation simulations over the span of approximately one semester. Participants were expected as well as advised to treat their lab experience as if it were a real job. During the simulations, students were divided up into teams where they operated a virtual airline. In order to thoroughly examine any potential attitudes, behaviors, actions, and or experiences the students possessed during these simulations, the lab collected data before training took place, post training, during the simulations, and after the simulations were completed. This has been an ongoing research study in the lab for several years. After students were onboarded in the lab, they received an online informed consent document that provided them with details of the purpose of the ongoing data collection. The consent form asked participants for permission to be observed by subject matter experts in the lab. Additionally, it asked for their participation in both post-training and post-simulation questionnaires. See Appendix A for this document. In order to capture performance, data submitted by the subject matter experts who observed the participants during the virtual flight operations, was utilized. To capture decision making under stress and individual adaptability measures for these participants, data was used from the questionnaires. The data utilized was from the capstone lab during the spring of 2017 and fall of 2017.

Experimental Setting

Aerospace Senior Capstone Lab. The aerospace senior capstone lab is a required course for senior undergraduate students in order to graduate. At the beginning of the semester, students are provided with an on-boarding experience for their mock-employer "Universal E–lines." After the onboarding process is complete, students are divided up into teams which consist of approximately ten members each. In order to create a diverse and well-structured team, as would be present for a real-world flight operation, assignment of members to groups is done based upon the concentration that each student has declared. Among these concentrations are: aerospace administration, flight dispatch, professional pilot, maintenance management, aerospace technology (i.e., engineering as it relates to the aviation field of study), and unmanned aircraft systems (UAS). Up until this course, these students have had limited exposure working with students who specialize in areas of aviation different from their own, as well as limited knowledge of these specializations.

Flight Operations Simulation. Each simulation lasts approximately two and a half hours. During these simulations, the teams must use their individual skills to work together and operate the airline efficiently and effectively. Though many of the operations that take place during the simulations are considered routine, each team is presented with obstacles before, during, or after the airplanes in Universal E Lines have taken flight. When concerns arise, participants must respond promptly to alleviate the issue at hand. These issues in the lab are referred to as "triggers." The triggers are novel to each simulation which calls for unique adaptability. For example, a team may receive an alert that a "bird strike" (bird has flown into the engine) has occurred, a passenger is

having a heart- attack, or that there has been a security breach at the airport ahead. A team member may declare that he or she needs assistance in alleviating the issue. Many times, this requires that team members volunteer to help with a position he or she may not be trained in, thus needing to demonstrate adaptability. During these stressful situations and the simulations as a whole, each individual is appraised by a trained evaluator and subject matter expert. Additionally, an evaluation takes place at the team level by trained evaluators. Each action made by the members must comply with Federal Aviation Administration regulations (e.g., taking into account the weather condition and attending to maintenance issues properly). If any actions made by the team members are deemed as "illegal" or noncompliant, it is noted by the subject matter experts. Each team experiences triggers that are in the same range of difficulty. Across simulations, the triggers are designed to become more complex, stressful, and frequent. For a more in-depth explanation of the simulation, please refer to Littlepage, Hein, Moffett, Craig, and Georgiou (2016).

Measures

The present study utilized archival data from four measures used in the capstone lab. Three of the four measures were administered to participants in the capstone lab through Qualtrics. All measures managed through Qualtrics were taken in the lab on computers. One of the four measures was a measure of individual performance. This measure was administered after each simulation to the subject matter expert who observed the individual. The individual adaptability measure (I-ADAPT-M) and the Decision Making Under Stress Scale (i.e., selected items from the Leadership Behavior Description Questionnaire) were administered to participants following their individual

completion of the training session designed for each position. The first flight operation simulation took place after these measures had been obtained. Once participants had experienced all three simulations, the I-ADAPT-M and DMUS scales were administered again. A week after each simulation, an after-action review took place. Upon completion of the after-action review, a 4-item stress scale was administered to participants. Therefore, each participant completed the 4-item stress scale a total of three times. The measure used to assess the performance of each individual in their area of expertise was administered to the subject matter experts following each simulation. This measure was also managed through Qualtrics; therefore, subject matter experts completed it electronically.

The Product of Stress. The phenomenon of naturalistic decision making explains scenarios in which individuals must make decisions in a dynamic and unstable environment whereby workers are presented with novel conditions and time pressure. Situations included in naturalistic decision making studies (e.g., in the airline industry) are deemed as stressful (e.g., Zsambok & Klein, 1997). The airline industry is often characterized by heavy workloads, small time frames to make important decisions in, and emergency situations. The senior capstone lab strives to provide students with an experience that is extremely similar to real life practice. In order for these simulations to be as similar to airline operating procedures as possible, the urgency of safety, efficiency, professionalism, and ethical behavior is expressed to all participants. This places a great deal of responsibility on each member. During the simulations and in the after-action review meetings, students often describe their experience in the senior capstone lab as stress-inducing. Taking these reactions into account, it is likely that students experienced

stress during the flight operation simulations. See Appendix C for the stress check items that were utilized in the current study.

Perceptions of Decision Making Under Stress. In an effort to study leadership effectiveness and decision making, a scale termed Decision Making Under Stress (DMUS), was created by Brace (2011). This scale was generated by selecting 14 items, relevant to decision making behaviors, from the full version of the Leadership Behavior Description Questionnaire (LBDQ-XII) (Stodgill, 1962). According to Brace et al., (2011) the items were left in the same order and formatting as they were presented in the LBDQ. Of the 14 items, 5 were reverse scored because they were phrased to reflect poor leadership. Reliability of the DMUS scale was tested for, and it was found to reach a Chronbach's alpha level of .810 and item-total correlations ranging from .175 to .568; thus, demonstrating good reliability (Brace, 2011). Examples of statements from this scale are "I anticipate problems and plan for them" and "I take full charge when emergencies arise." See Appendix B for more statements. Participants are asked to indicate a response to the items on a 5-point Likert scale which ranges from 1(*never*) to 5 (*always*). Higher scores correspond to more effective decision making under stress while lower scores indicate less effective decision making under stress. This scale was used in the present study in order to measure participants' perceptions of their ability to make decisions under stress.

Individual Performance. The measures to assess individual performance quality in the capstone lab were created by Industrial and Organizational Psychology Master's candidates from positional job analyses information. After the initial development of the measures, subject matter experts on each specific position present in the flight operations

center modified them before lab use. There are seven unique positions in the flight operations center that were chosen to mirror key roles that are present in regional airlines. These positions include: Flight Operations Coordinator (FOC), Crew Scheduling, Maintenance Control, Weather and Forecasting, Hub Coordinator, Flight Scheduling (FOD 1), Flight Planning (FOD 2).

Though the measures for each of these positions are similar, they contain items that differ slightly in order to account for the different responsibilities, behaviors, and tasks unique to each position. However, as a whole, the measures have identical items that assess procedural and non-procedural task work, situational awareness, consideration of future consequences, communication, information solicitation, and problem-solving and decision making. Acceptable internal consistency for each position has been reached: Flight Operations Coordinator: $\alpha = .93$; Crew Scheduling $\alpha = .84$; Weather and Forecasting $\alpha = .90$; FOD 1 $\alpha = .81$; and FOD 2 $\alpha = .84$; Hub Coordinator: $\alpha = .75$; Maintenance Control: $\alpha = .92$.

SMEs who were assigned to observe a specific position use the corresponding measure to rate the task in each item statement in relevance to the frequency with which it was completed by the participants. Each item is rated by using a 7- point Likert scale where 1 indicates “never” and 7 indicates “always.” An example of a statement from the Weather Operation’s measure is “recommends a safe route for flights after considering all information on weather conditions.” Refer to Appendix D for the individual performance measures.

Individual Perceptions of Adaptability. A focus for the present study is to obtain knowledge of participants’ perceptions of their ability to adapt. In order to do so,

the I-ADAPT measure was utilized. The I-ADAPT measure was constructed by Ployhart and Bliese (2006). Ployhart and Bliese explained that individual adaptability "represents an individual's ability, skill, disposition, willingness, and/or motivation, to change or fit different task, social, and environmental features" (Ployhart & Bliese, 2006, p. 13). In the current study's experimental environment, the capstone lab, students received the opportunity to demonstrate their ability and skill while responding to novel environmental features. Considering participants work in groups, their experience involves social components as well.

The I-ADAPT encompasses 55 items that are proposed to assess individuals' adaptability. These items were constructed using eight unique dimensions that make up adaptive performance, which were developed by Pulakos et al. (2000). Thus, the I-ADAPT considers individual adaptability to be multidimensional, and representative of eight latent subdimensions. See Table 1 for more thorough descriptions of the eight dimensions.

Reliability of the model as a whole has been found to reach an alpha level of .91 (Calarco, 2016). Internal consistency levels for each of the 8 dimensions has been found to range from .92 to .97 (Pulakos et al., 2000). Also, fit indices for univariate, two-factor and eight-factor models of adaptive performance revealed the eight-factor model best fit the data (Pulakos et al., 2000).

Wang, Zhan, McCune, & Truxillo (2011) using a Chinese sample, tested five of the eight subdimensions and also found acceptable reliability levels. The following alpha levels were reached for the five subdimensions: cultural adaptability ($\alpha = .83$), work stress adaptability ($\alpha = .86$), learning adaptability ($\alpha = .77$), interpersonal adaptability (α

= .89), and adaptability to uncertainty (α = .84) (Wang, Zhan, McCune, & Truxillo, 2011).

For the scope of this study, all eight dimensions of the I-ADAPT were not used. The primary researcher only analyzed data from the dimensions that were believed to be relevant to the present research experimental environment. Therefore, the present study took into account the following dimensions: handling emergencies or crisis situations, handling work stress, solving problems creatively, dealing with uncertain and unpredictable work situations, and demonstrating interpersonal adaptability, and learning work tasks, technologies, and procedures

As mentioned previously, participants in the capstone lab experience "triggers" which are novel and stressful situations that, in real-life, could potentially lead to life or death circumstances for their passengers. During these times, participants must work individually and or collectively to come up with the best solution. Therefore, crisis adaptability and creative adaptability were thought to be two dimensions of individual adaptability relevant to the capstone lab. The triggers implemented in the lab are also unexpected and unpredictable; thus, uncertainty adaptability was discerned as important as well. In addition to the steady workflow that is expected to be maintained throughout the simulations, participants in the capstone lab are expected to accept more work and adjust to high risk situations; hence, demonstrating work stress adaptability. Another dimension of the I-ADAPT that was of interest is the participants' ability to adjust to changing work tasks, technologies, and procedures. This aspect was deemed as important because those who participate in the capstone lab will often experience novel tasks and procedures and may need to adapt to changing technology. Lastly, the flight operations

center requires effective communication among team members, and the ability to form relationships that are conducive to the completion of a team's responsibilities. Therefore, the dimension of interpersonal adaptability will be utilized as well. See Appendix E for each item in the I-ADAPT.

CHAPTER III: RESULTS

Statistical Analyses

Analyses were conducted using SPSS to determine the scale reliabilities of the decision making under stress pre and post measure (DMUS), the individual adaptability pre and post measure (I-ADAPT), the stress check at times 1, 2, and 3, and the individual performance pre and post measure. The coefficient alphas of each scale were fairly high, with most alphas ranging from .8 to .9. Chronbach's alpha levels of .83 (pre) and .81 (post) were reached for the measure of decision making under stress (DMUS). Chronbach's alpha levels of .93 (pre) and .93 (post) were reached for the measure of individual adaptability (I-ADAPT). Finally, Chronbach's alpha levels of .83 (time 1), .84 (time 2), and .84 (time 3) were reached for the stress check. Descriptive Statistics for each administration of the measure for decision making under stress, individual adaptability, and the stress check can be found in Table 2. Descriptive statistics for individual performance for each of the specialized simulation positions in the capstone lab can be found in Table 3. For ease of interpretation, individual performance at time two was excluded from the analyses.

Table 2
Descriptive Statistics for Stress, I-ADAPT, and DMUS

Measure	*n*	*M*	*SD*
Stress (time 1)	174	2.76	3.62
Stress (time 2)	150	3.00	3.47
Stress (time 3)	137	2.93	3.44
I-ADAPT (pre)	158	3.93	16.75
I-ADAPT (post)	111	4.0	17.47
DMUS (pre)	71	3.51	6.32
DMUS (post)	71	3.51	5.40

Table 3
Descriptive Statistics for Individual Performance Measures

Simulation Position	*n*	*M*	*SD*	α
Flight Operations Coordinator (time 1)	19	4.33	.69	.90
Flight Operations Coordinator (time 3)	16	4.38	1.05	.95
Crew Scheduling (time 1)	18	5.58	1.27	.93
Crew Scheduling (time 3)	16	6.16	.91	.96
Maintenance Control (time 1)	19	4.57	1.03	.93
Maintenance Control (time 3)	8	5.32	1.02	.95
Weather and Forecasting (time 1)	6	4.26	1.29	.90
Weather and Forecasting (time 3)	6	5.08	1.41	.90
Hub Coordinator (time 1)	10	5.11	1.06	.69
Hub Coordinator (time 3)	8	4.90	1.11	.84
Flight Scheduling (time 1)	19	4.68	1.20	.89
Flight Scheduling (time 3)	15	4.37	1.27	.90
Flight Planning (time 1)	19	5.65	.69	.89
Flight Planning (time 3)	15	6.19	.99	.91

A visual representation of the interaction between participants' individual adaptability and time when predicting perceptions of decision making under stress can be viewed in Figure 3. Figure 4 displays the interaction between participants' perceptions of decision making under stress and time when predicting individual performance.

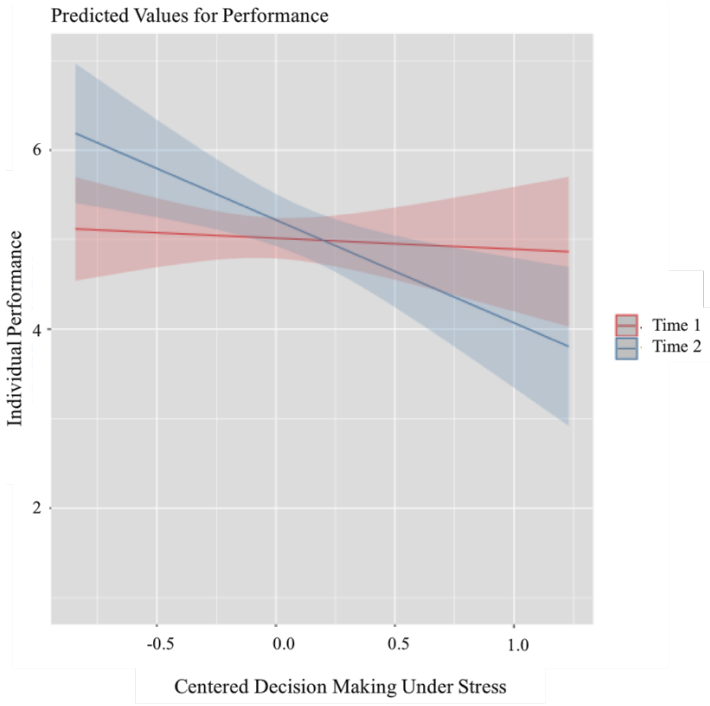

Figure 3. The Relationship between Time and DMUS

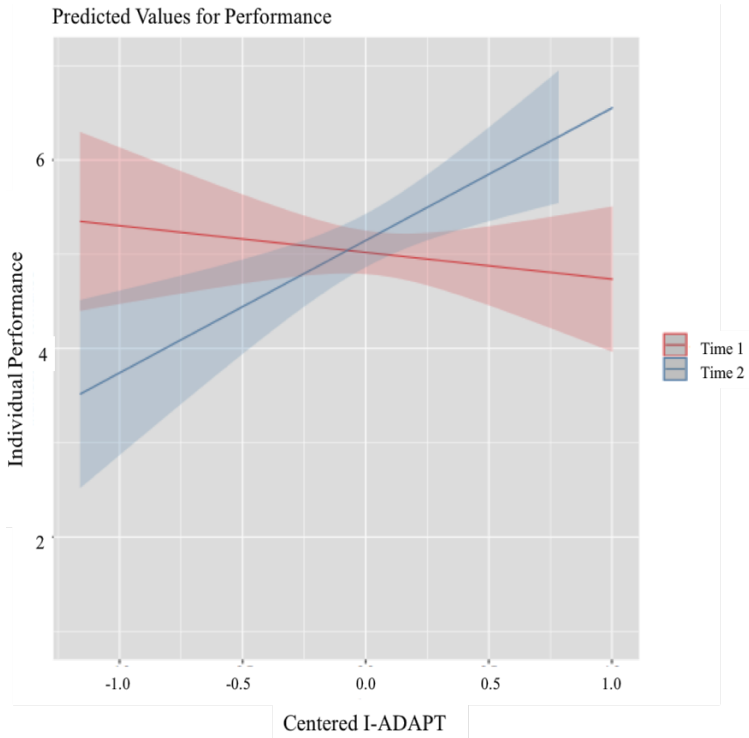

Figure 4. The Relationship between Time and I-ADAPT

Stress Check. According to the stress check, stress did rise at time two, but was not significantly different at time three F (2, 462) = 3.42; p = .03. The average stress score on the scale that ranged from one to five was a three or below. This indicates that the simulations utilized in the current study are not deemed as very stressful.

Hypotheses. Because the data were collected over multiple time points, a series of linear mixed effects models were used to test the hypotheses and research questions using the lme4 package in R (Bates, Maechler, Bolker, & Walker, 2015). It is worth noting that the analyses testing the hypotheses collapsed across time because time was the focus of the research questions. Hypothesis 1 stated that perceptions of individual adaptability would have a positive relationship with individual performance. To test this hypothesis, individual adaptability was entered as a fixed effect predicting individual performance. Individual adaptability was not significantly correlated with individual performance, β = 0.08, t(172) = 0.36, p > .05. Thus, hypothesis 1 was not supported.

Hypothesis 2 stated that there would be a significant positive relationship between individual adaptability and perceptions of decision making under stress. To test this hypothesis, individual adaptability was entered as a fixed effect predicting perceptions of decision making under stress. Individual adaptability was significantly associated with perceptions of decision making under stress, β = .81, t(309) = 17.14, p < .05. Thus, hypothesis 2 was supported.

Hypothesis 3 stated that perceptions of decision making under stress would be positively related to individual performance. To test this hypothesis, perceptions of decision making under stress was entered as a fixed effect predicting individual

performance. Decision making under stress was not significantly correlated with individual performance, β = -0.23, t(172) = -1.18, p > .05.

Hypothesis four stated that the proposed relationship between participants' perceptions of individual adaptability and individual performance would be mediated by their perceptions of their ability to make decisions while under stress. To test this hypothesis, I used a Baron and Kenny (1986) approach, with each of the different steps tested in hypotheses 1-3. The final step had individual adaptability and perceptions of decision making under stress both entered as fixed effects predicting individual performance. Results indicated that participants' perceptions of their ability to make decisions while under stress does not mediate the relationship between participants' individual adaptability and individual performance. In this final step, individual adaptability was not found to predict performance, β = .48, t(172) = 1.58, p >.05, nor was decision making under stress, β = -0.51, t(172) = -1.94 p > .05. It should also be noted that the relationship between individual adaptability and performance increased from β = .08 to β = .48 when the mediator was included. This is the opposite of what one might expect to occur if mediation was present.

Research Questions. The research questions stated that time would impact each relationship proposed in the model. To test this, I conducted a test of moderation and included time as an interaction. No evidence of moderation was found; therefore, there was no need to test each research question. The model was tested in order to see if there were any interaction effects of time with the hypotheses. Results indicated that there was a significant interaction between decision making under stress and time when predicting individual performance (β = - .51, t(172) = -2.16, p < .05, r(172) = -67), such that the

relationship was stronger at time 2 (β = -1.15) than at time 1 (β = -.12). The negative relationship between these two variables came as a surprise. Because the measure was created from a previous measure that was used to assess leadership behaviors (LBDQ** Form XII) it is possible that the DMUS is a better measure of leadership and the participants who were better leaders did not perform well in a team environment.

There was also a significant interaction between individual adaptability and time when predicting individual performance β = .84, $t(172) = 3.06$, $p < .05$, such that the relationship was stronger at time 2 (β = 1.40) than at time 1 (β = -0.28). The results also indicated that time significantly interacts with participants' individual adaptability (β = .84, $t(172) = 3.06$, $p < .05$) and perceptions of decision making under stress (β = - .51, $t(172) = -2.16$, $p < .05$) to predict performance.

CHAPTER IV: DISCUSSION

The objective of the current research was to explore the relationships between individual adaptability, perceptions of decision making under stress, performance, and the effect of time. Descriptive statistics for the stress check revealed that participants were not highly stressed, but rather experienced a moderate amount of stress after each simulation. Observations and personal anecdotes from participants indicated that the simulations were deemed as highly stressful; therefore, this result was unexpected. It is possible that participants' perceptions of stress were not accurate due to the delay in time (one week) of administration of the stress check after each simulation.

Hypothesis 1 was not supported. Results indicated that participants' perceptions of individual adaptability were not related to participants' individual performance. Though there is a lack of research that utilizes a validated measure of individual adaptability in order to assess the relationship between individual adaptability and performance, this result was unexpected. Research that has aimed to test this relationship has found results that indicated that there is a positive relationship between participants' individual adaptability and performance (e.g., Parent & Levitt, 2009). The lack of support in the current study could potentially be due to low sample size.

Hypothesis 2 stated that participants' perceptions of individual adaptability would be positively correlated with participants' perceptions of their ability to make decisions while under stress. This hypothesis was supported. This is consistent with literature that proposed that individual adaptability would influence individuals' perceptions, such as their perceptions of the nature of a situation (Ployhart & Bliese, 2006). However, this is

the only study to my knowledge that has specifically tested the relationship between perceptions of decision making under stress and perceptions of individual adaptability.

Hypothesis 3 and 4 were not supported. Hypothesis 3 stated that participants' perceptions of their ability to make decisions while under stress would be positively correlated with individual performance. This was inconsistent with literature that proposed that individual's perceptions (e.g., of a situation) would influence their performance (Ployhart & Bliese, 2006). This was also inconsistent with the idea that this measure is similar to self-efficacy, though more task-specific, and would also be positively correlated with individual performance. Hypothesis 4 proposed that the relationship between individual adaptability and individual performance would be mediated by decision making under stress. The lack of support for this relationship also was unexpected.

Though hypotheses 1, 3, and 4 did not gain support, time (or experience) was found to play a major role in the proposed relationships. Results indicated that there was a significant interaction between decision making under stress and time when predicting individual performance. The negative relationship between these variables came as a surprise. Because the measure was created from a previous measure that was used to assess leadership behaviors (LBDQ** Form XII) it is possible that the DMUS is a better measure of leadership and the participants who were better leaders did not perform well in a team environment.

Results also indicated that there was a significant interaction between individual adaptability and time when predicting individual performance. Furthermore, the results from the analyses suggested that in the flight operations training, time interacted with

both individual adaptability and perceptions of decision making under stress when predicting performance. These relationships were found to be stronger at time two such that the relationship between the I-ADAPT and individual performance becomes stronger while the relationship between perceptions of decision making under stress and individual performance weakens. These results can have great implications for research in the context of flight operations training. These findings indicate that time or experience is an important factor to consider when researching the proposed relationships in this study.

Limitations & Future Research

Low sample size was a limitation for this study. This was due to a total of only 187 people (creating 19 groups) being available for analyses. The low sample size is due to limitations that are set by the university for the capstone course on how many students can be enrolled during a semester. However, data will continue to be collected at the university capstone lab which could help to resolve this limitation in future study efforts. A related limitation is attrition. This was due to the data collection process taking place over the span of a semester. Another limitation for this study was the low number of subject matter experts that were available in the lab to observe and rate the individuals' performance. It was not possible to have multiple raters assigned to each participant for interrater reliability purposes. Future studies should seek to have more than one subject matter expert available to rate each individual.

The time of administration of the stress check as well as the items in the stress check could also be a limitation for the current study. Participants were administered the stress check a week after they participated in each simulation. Additionally, the stress

check items did not specifically address the prior simulation, and could have appeared to indicate that participants should report their feelings of stress in regards to the simulations in general. Furthermore, the items within the stress check do not specifically address participants' stress, and instead uses words such as "busy" or "pressured." Future studies similar to the current study should implement a stress check during each simulation and immediately following each simulation in order to gain a more accurate representation of participants' stress.

A potential limitation for this study is the nature of the DMUS scale and the individual performance measure. The DMUS scale consists of 14 items that were adapted from the Leadership Behavior Description Questionnaire (Form XII). Though the items were carefully selected based on whether they were deemed to measure perceptions of decision making under stress, it is possible that the items are not fully capturing the concept of decision making under stress, but rather a different concept. Future studies should closely assess the scale items in order to better understand which concept is being assessed with the items. Similarly, the individual performance measures may not effectively capture the concept of adaptive performance. The items within the measures for each position assess both routine and adaptive performance. However, some positions do not have any items that assess adaptive performance. The lack of a clean measure of adaptive performance should be considered in future studies.

Another potential limitation is in regards to the unique setting of the lab. It is possible that any findings in the lab could be context specific and may not generalize to other settings. Future study efforts should aim to test these relationships in settings that are different than the experimental setting utilized for this study.

Conclusion

Individual adaptability and decision making under stress have been prevalent topics among researchers today. Though literature on decision making under stress is vast, it is less common for researchers to examine the relationship between participants' perceptions of their ability to make decisions under stress and individual differences (e.g., adaptability). Results from the current study demonstrate the importance of studying individual differences in the realm of decision making under stress research. Further, this study highlights the potential benefits of including the variable of time (experience) in future studies that involve exploring the relationships between decision making under stress and performance as well as individual adaptability and performance.

REFERENCES

Baard, S. K, Rench, T. A, & Kozlowski, S. W. J (2014). Performance adaptation: A theoretical integration and review. *Journal of Management*, *40*(1), 48-99.

Bandura, A. (1994). Self-efficacy. In V. S. Ramachaudran (Ed.), Encyclopedia of human behavior (Vol. 4, pp. 71-81). New York: Academic Press. (Reprinted in H. Friedman [Ed.], Encyclopedia of mental health. San Diego: Academic Press, 1998).

Bandura, A. (1997). *Self-efficacy: the exercise of control*. New York: W.H. Freeman, c1997.

Baretta, D., Greco, A., & Steca, P. (2017). Understanding performance in risky sport: The role of self-efficacy beliefs and sensation seeking in competitive freediving. *Personality and Individual Differences*, 161. doi:10.1016/j.paid.2017.06.006

Beach, L. R., & Mitchell, T. R. (1998). A contingency model for the selection of decision strategies. In L. R. Beach (Ed.), *Image theory: Theoretical and empirical foundations* (pp. 145-158). Mahweh, NJ: Lawrence Erlbaum.

Boylan, S. A., & Turner, K. A. (2017). Developing organizational adaptability for complex environment. *Journal of Leadership Education*, *16*(2), 183-198.

Byrne, K. A., Silasi-Mansat, C. D., & Worthy, D. A. (2015). Who chokes under pressure? The big five personality traits and decision-making under pressure. *Personality and Individual Differences*, 7422-28. doi:10.1016/j.paid.2014.10.009

Cannon-Bowers, J. A., & Salas, E. (1999). Decision making under stress: Implications for individual and team training. Washington, D.C.

Chan, D. (2000). Understanding adaptation to changes in the work environment: Integrating individual difference and learning perspectives. *Research in Personnel and Human Resources Management, 18,* 1-42.

Denison, D.R., Janovics, J., Young, J., Cho, J.H (2006). Diagnosing organizational cultures: Validating a model and method, Denison consulting, Washington.

Bates, D., Maechler, M., Bolker, B., Walker, S., (2015). Fitting linear mixed-effects models using lme4. *Journal of Statistical Software*, 67(1), 1-48.<doi:10.18637/jss.v067.i01>.

Hewitt, M. P. (n.d). Self-Efficacy, self-evaluation, and music performance of secondary-level band students. *Journal of Research in Music Education*, *63*(3), 298-313.

Huang, J. L., Ryan, A. M., Zabel, K. L., & Palmer, A. (2014). Personality and adaptive performance at work: A meta-analytic investigation. *The Journal of Applied Psychology*, *99*(1), 162-179. doi:10.1037/a0034285

Hwang, M., Choi, H., Lee, A., Culver, J., & Hutchison, B. (2016). The relationship between self-efficacy and academic achievement: A 5-year panel analysis. *Asia-Pacific Education Researcher (Springer Science & Business Media B.V.)*, *25*(1), 89-98. doi:10.1007/s40299-015-0236-

Jundt, D. K., Shoss, M. K., & Huang, J. L. (2015). Individual adaptive performance in organizations: A review. *Journal of Organizational Behavior*, (SUPP/1). S53.

Lawler, E. E., & Worley, C. G. (2006). *Built to change. [electronic resource]: how to achieve sustained organizational effectiveness*. San Francisco, CA: Jossey-Bass, c2006.

Lisbona, A., Palaci, F., Salanova, M., & Frese, M. (2018). The effects of work engagement and self-efficacy on personal initiative and performance. *Psicothema*, *30*(1), 89-96. doi:10.7334/psicothema2016.245

Littlepage, G. E., Hein, M. B., Moffett, R. I., Craig, P. A., & Georgiou, A. M. (2016). Team training for dynamic cross-functional teams in aviation: Behavioral, cognitive, and performance outcomes. *Human Factors*, (8), 1275. doi:10.1177/0018720816665200

Martin, A., Nejad, H., Colmar, S., & Liem, G. (2013). Adaptability: how students' responses to uncertainty and novelty predict their academic and non-academic outcomes. *Journal of Educational Psychology*, (3). 728.

McPherson, G. E., & McCormick, J. (2006). Self-efficacy and music performance. *Psychology of Music*, *34*(3), 322-336. doi:10.1177/0305735606064841

Mohammed, S., & Schwall, A. (2009). Individual differences and decision making: What we know and where we go from here. *International Review of Industrial and Organizational Psychology*, 249.

Parent, J. D., & Levitt, K. (2009). Manager vs. employee perceptions of adaptability and work performance. *Business Renaissance Quarterly*, *4*(4), 23-48.

Plant, K., & Stanton, N. (2013). The explanatory power of Schema Theory: theoretical foundations and future applications in Ergonomics. *Ergonomics -London-*, (1). 1.

Ployhart, R. E., & Bliese, P.D. (2006). Individual adaptability (I-ADAPT) theory: Conceptualizing the antecedents, consequences, and measurement of individual differences in adaptability. In C. S. Burke, L. G. Pierce, & E. Salas (Ed.), Understanding adaptability: A prerequisite for effective performance within complex environments (pp. 3-39). San Diego, CA: Elsevier Ltd.

Pope, J. L., & Littlepage, G., (2017, March). *Adaptive aviation: Individual and team adaptive capacity in flight operations teams.* Poster session presented at MTSU Scholars Week, Murfreesboro, TN.

Pulakos, E. D., Arad, S., Donovan, M. A., & Plamondon, K. E. (2000). Adaptability in the workplace: Development of a taxonomy of adaptive performance. *Journal of Applied Psychology*, (4), 612.

Pulakos, E. D., Schmitt, N., Dorsey, D. W., Arad, S., Hedge, J. W., & Borman, W. C. (2002). Predicting adaptive performance: Further tests of a model of adaptability. *Human Performance*, (4), 299.

Raelin, J. A., (1984). An examination of deviant/adaptive behaviors in the organizational careers of professionals. *The Academy of Management Review*, (3), 413.

Ritchie, L., & Williamon, A. (2012). Self-efficacy as a predictor of musical performance quality. *Psychology of Aesthetics, Creativity, and The Arts*, *6*(4), 334-340. doi:10.1037/a0029619

Schmitt, N., & Borman, W. C. (1992). *Personnel selection in organizations*. San Francisco: Jossey-Bass, c1993.

Shiloh, S., Koren, S., & Zakay, D. (2001). Individual differences in compensatory decision-making style and need for closure as correlates of subjective decision complexity and difficulty. *Personality and Individual Differences*, 30699-710. doi:10.1016/S0191-8869(00)00073-8

Starcke, K., & Brand, M. (2012). Decision making under stress: A selective review. *Neuroscience and Biobehavioral Reviews*, *36*(4), 1228-1248. doi:10.1016/j.neubiorev.2012.02.003

Starcke, K., Markowitsch, H., Brand, M., & Wolf, O. (2008). Anticipatory stress influences decision making under explicit risk conditions. *Behavioral Neuroscience*, 122(6), 1352-1360. doi:10.1037/a0013281

Super, D.E., & Knasel, K.G. (1979) Development of a model, specifications, and sample items for measuring career adaptability (vocational maturity) in young blue collar workers. Cambridge, England: National Institute for Career Education and Counseling, and Ottawa, Ontario, Canada Employment and Immigration.

Talsma, K., Schüz, B., Norris, K., & Schwarzer, R. (2018). I believe, therefore I achieve (and vice versa): A meta-analytic cross-lagged panel analysis of self-efficacy and academic performance. *Learning and Individual Differences*, *61,*136-150. doi:10.1016/j.lindif.2017.11.015

Ritchie, L., & Williamon, A. (2012). Self-efficacy as a predictor of musical performance quality. *Psychology of Aesthetics, Creativity, and the Arts*, *6*(4), 334-340. doi:10.1037/a0029619

Song, J., Bae, S., Chai, D., & Kim, J. (2018). Job Performance in the learning organization: The mediating impacts of self-efficacy and work engagement. *Performance Improvement Quarterly*, *30*(4), 249-271. doi:10.1002/piq.21251

Vancouver, J. B., Thompson, C. M., Tischner, E. C., & Putka, D. J. (2002). Two studies examining the negative effect of self-efficacy on performance. *Journal of Applied Psychology*, 87(3), 506-516. doi:10.1037/0021-9010.87.3.506

Wright, B. J., O'Halloran, P. D., & Stukas, A. A. (2016). Enhancing self-efficacy and performance: An experimental comparison of psychological techniques. *Research Quarterly for Exercise and Sport*, *87*(1), 36-46. doi:10.1080/02701367.2015.1093072

Zsambok, C. E., Klein, G. (1997). *Naturalistic decision making*. Mahwah, NJ: Lawrence Erlbaum Associates.

APPENDICES

Appendix A

Middle Tennessee State University Institutional Review Board
Informed Consent Document for Research

Principal Investigator: Andrea Georgiou
Study Title: NASA FOCUS Lab
Institution: Middle Tennessee State University

The following information is provided to inform you about the research project and your participation in it. Please read this form carefully and feel free to ask any questions you may have about this study and the information given below. You will be given an opportunity to ask questions, and your questions will be answered. Also, you will be given a copy of this consent form.

The *Aerospace Senior Capstone Lab* (AERO 4040) is a required course for graduation; however, your participation in the research study and lab simulations is voluntary. You are also free to withdraw from the lab and this study at any time. In the event new information becomes available that may affect the risks or benefits associated with this research study or your willingness to participate in it, you will be notified so that you can make an informed decision whether or not to continue your participation in this study.

For additional information about giving consent or your rights as a participant in this study, please feel free to
contact the MTSU Office of Compliance at (615) 494-8918.

1. Purpose of the study:
You are being asked to participate in an ongoing research study because the Principal Investigator and co-investigators are interested in your perceptions, work habits, attitudes, actions, and individual experiences pertaining to your overall experience while working in the NASA Flight Operations Center – Unified Simulation Lab.
2. Description of procedures to be followed and approximate duration of the study:
Participants will complete simulated work activities and be faced with both routine and non-routine events related to working in a flight dispatch center or flight simulator. Some situations will resemble threats to airline safety. During the simulations, you will be observed by Aerospace faculty and researchers. Following simulations, participants will complete surveys inside the Business and Aerospace Building computer lab. The surveys take approximately 45 minutes or less to complete. Each survey has several sections which ask participants to respond to questions based on the experiences in the simulation. The questionnaires ask for responses to attitude and behavioral questionnaires and ratings of observed behavior. A researcher will debrief participants the week following each simulation. Each week team performance data are recorded and compiled for feedback purposes as well as future analyses.
3. Expected costs:

N/A

4. Description of the discomforts, inconveniences, and/or risks that can be reasonably expected as a result of participation in this study:

There are no foreseeable risks, discomforts, or inconveniences associated with participation in this study. None of the measures present more than a minimal risk to participants. None of the data would reasonably place participants at risk of criminal or civil liability or be damaging to participants' financial standing, employability, insurability, reputation, or be stigmatizing.

5. Compensation in case of study-related injury:

MTSU will not provide compensation in the case of study related injury.

Middle Tennessee State University Institutional Review Board
Informed Consent Document for Research

6. Anticipated benefits from this study:
a) The potential benefits to science and humankind: potential benefits to the education and training of university students in aerospace programs, to members of aerospace and airline industries, and to members of government agencies dealing with the aerospace industry.
b) The potential benefits to you from this study: participants will gain a better understanding of how to be effective members of a team in the workplace, including such skills as communication and group decision making. This study has both personal and career relevant benefits.

7. Alternative treatments available:
N/A

8. Compensation for participation:
You will not receive any compensation for participation in this study.

9. Circumstances under which the Principal Investigator may withdraw you from study participation:
N/A

10. What happens if you choose to withdraw from study participation:
There are no penalties for choosing to withdraw from the study.

11. Contact Information. If you should have any questions about this research study or possible injury, please feel free to contact Andrea Georgiou at (615) 904-8495; Michael Hein at (615) 898-2127; Paul Craig at (615) 898-2788; Rick Moffett at (615) 898-2686; Glenn Littlepage at (615) 898-2735.

12. Confidentiality. All efforts, within reason, will be made to keep the personal information in your research record private but total privacy cannot be promised. Your information may be shared with MTSU or the government, such as the Middle Tennessee State University Institutional Review Board, Federal Government Office for Human Research Protections, if you or someone else is in danger or if we are required to do so by law.

13. STATEMENT BY PERSON AGREEING TO PARTICIPATE IN THIS STUDY
By clicking "I consent," I am certifying that (1) I am at least 18 years of age, (2) I have read this informed consent document and the material contained in it has been explained to me verbally, (3) I understand each part of the document, all my questions have been answered, and (4) I freely and voluntarily choose to participate in this study.

Appendix B

Decision Making Under Stress Scale

selected items from LBDQ** Form XII

---

1. *6) I am hesitant about taking initiative in the group.
2. 9) I make accurate decisions.
3. *12) I become anxious when I cannot find out what is coming next.
4. 29) I am able to predict what is coming next.
5. 44) I decide what shall be done and how it shall be done.
6. 59) I am accurate in predicting the trend of events.
7. *61) I get swamped by details.
8. 72) I Remain calm when uncertain about coming events.
9. 76) I take full charge when emergencies arise.
10. 78) I drive hard when there is a job to be done.
11. 81) I can reduce a madhouse to system and order.
12. 89) I Anticipate problems and plans for them.
13. *91) I gets confused when too many demands are made of me
14. *92) I worry about the outcome of any new procedure.

Note. * = reverse scored. ** = Leadership Behavior Description Questionnaire. The first number denotes the order in which that item appears in this measure. The second number corresponds to the order in which that item appears in the original measure. Items in survey are reworded to conform to first person.

Response options:
1 = Never
2 = Seldom
3 = Occasionally
4 = Often
5 = Always

Appendix C

Stress Check

---

1. I feel used up at the end of the focus lab.
2. I feel that my workload in the lab interferes with the quality of my work.
3. I feel busy or rushed during the lab.
4. I feel pressured during the lab.

Response options:
1 = Strongly disagree
2 = Disagree
3 = Neutral
4 = Agree
5 = Strongly Agree

Appendix D

Individual Performance Measure - Flight Operations Coordinator (FOC)

Team _____ Semester *Fall 2017* SIM (Circle) 1 2 3 Date of SIM_____

Rater_____

On a scale of 1 to 7, *where 1 is never and 7 is always*, please rate each task in way that would best represent individual's behavior throughout the entire flight simulation.

Never ***Sometimes*** ***Always***

1 2 3 4 5 6 7

1. _____ Performs dispatch duties in a timely manner.
2. _____ Makes effective decisions to resolve unusual events.
3. _____ Multitasks and makes assertive decisions under time-stress situations.
4. _____ Most often anticipates flight delays and cancellations.
5. _____ Employs proactive strategies to remedy the situation/event that takes place during the simulation.
6. _____ Remains cognizant of all ongoing issues that take place during the simulation.
7. _____ Operates in accordance to FAA Regulations (e.g., does not violate tarmac rule, does not release a flight to a destination where the flight is not capable to land).
8. _____ **Information Flow**: Shares relevant information as needed with other team members.
9. _____ **Information Utilization:** When appropriate, actively solicits information from key team members in order to arrive to best quality decisions.
10. _____ **Coordination:** Coordination with other team members is effective. (Proper phraseology/Efficient communication channels are always used.)

Individual Performance Measure - Weather & Forecasting (WX)

Team _____ Semester *Fall 2017* SIM (Circle) 1 2 3 Date of SIM_____

Rater_____

On a scale of 1 to 7, *where 1 is never and 7 is always*, please rate each task in way that would best represent individual's behavior throughout the entire flight simulation.

Never ***Sometimes*** ***Always***

1 2 3 4 5 6 7

1. _____ Identifies weather conditions that will impact a flight prior to departure, *en route*, or upon arrival (e.g., cross winds).
2. _____ Notifies relevant team members of weather conditions that may impact a flight or the flight schedule (e.g., headwinds, NOTAMs, destination alternates, and icing conditions).
3. _____ Advises team on weather conditions using quality information (i.e., is specific and effective and uses appropriate terminology).
4. _____ Recommends a safe route for flights after considering all information on weather conditions.
5. _____ Recommends a viable destination alternate to the team when required.
6. _____ Violates airline operating procedures and/or general FAA regulations (e.g., the 1-2-3 rule, take-off visibility minimums, lands on wet runway with tail winds greater than 5 knots, etc.) (*R)
7. _____ Causes unnecessary delays because of a failure to clear flights in a timely manner. (*R)
8. _____ **Information Flow**: Shares relevant information as needed with other team members.
9. _____ **Information Utilization:** When appropriate, actively solicits information from key team members in order to arrive to best quality decisions.
10. _____ **Coordination:** Coordination with other team members is effective. (Proper phraseology/Efficient communication channels are always used.)

Individual Performance Measure - Crew Scheduling (CS)

Team _____ Semester *Fall 2017* SIM (Circle) 1 2 3 Date_____
Rater_____

On a scale of 1 to 7, *where 1 is never and 7 is always*, please rate each task in way that would best represent individual's behavior throughout the entire flight simulation.

Never ***Sometimes*** ***Always***

1 2 3 4 5 6 7

1. _____ Effectively keeps track of crews' duty times.
2. _____ Incorporates all the flight delays/cancellations into crew's duty times.
3. _____ Incorporates calls in to an optimal reserve crew in a timely fashion.
4. _____ Is able to multitask and work well under time-stress situations, prioritizing his/her work in accordance to the event/scenarios that take place during the simulation.
5. _____ Ensures that crews are not scheduled for flights that will result in busted times (e.g., dead heading reserve crews when appropriate, rotating crews).
6. ITEM REMOVED – Operates in accordance with FAA regulations (see item 5).
7. _____ **Information Flow**: Shares relevant information as needed with other team members.
8. _____ **Information Utilization:** When appropriate, actively solicits information from key team members in order to arrive to best quality decisions.
9. _____ **Coordination:** Coordination with other team members is effective. (Proper phraseology/Efficient communication channels are always used.)

Individual Performance Measure - Flight Ops Data 2 (Flight Planning)

Team _____ Semester *Fall 2017* SIM (Circle) 1 2 3 Date of SIM_____

Rater_____

On a scale of 1 to 7, *where 1 never and 7 is always*, please rate each task in way that would best represent individual's behavior throughout the entire flight simulation.

Never ***Sometimes*** ***Always***

1 2 3 4 5 6 7

1. _____ Enters the appropriate information into the Spreadsheet.
2. _____ Determines weight and balance information in a timely fashion.
3. _____ Accurately determines fuel, weight and balance information.
4. _____ Effectively bumps passengers and cargo as needed.
5. _____ When necessary, quickly and efficiently reroutes bumped passenger & cargo.
6. _____ Operates in accordance to FAA Regulations (e.g., does not allow flights to take off and/or land overweight/overbooked, always ensures a proper fuel load for flights).
7. _____ **Information Flow**: Shares relevant information as needed with other team members.
8. _____ **Information Utilization:** When appropriate, actively solicits information from key team members in order to arrive to best quality decisions.
9. _____ **Coordination:** Coordination with other team members is effective. (Proper phraseology/Efficient communication channels are always used.)

Individual Performance Measure - Flight Ops Data 1 (Flight Scheduling)

Team _____ Semester *Fall 2017* SIM (Circle) 1 2 3 Date of SIM_____

Rater_____

On a scale of 1 to 7, *where 1 is never and 7 is always*, please rate each task in way that would best represent individual's behavior throughout the entire flight simulation.

Never Sometimes Always

1 2 3 4 5 6 7

1. _____ Accurately timestamps all of the released flights immediately after the flights were released by the FOC.
2. _____ Accurately timestamps all of the arrival flights immediately after the radar indicated flight was in approach.
3. _____ Effectively indicates special status of flights on schedule display (e.g., delays, maintenance, emergencies, etc.).
4. _____ Maintains visual organization of the radar screen (i.e., screen is readable with no difficult-to-read data and no overlapping).
5. ITEM REMOVED – Operates in accordance with FAA regulations.
6. _____ **Information Flow**: Shares relevant information as needed with other team members.
7. _____ **Information Utilization:** When appropriate, actively solicits information from key team members in order to arrive to best quality decisions.
8. _____ **Coordination:** Coordination with other team members is effective. (Proper phraseology/Efficient communication channels are always used.)
9. _____ Maintains flight schedule, updating the status of flights as issues are resolved.
10. _____ Assists the FOC in staying on schedule.

Individual Performance Measure – Maintenance Control (MX)

Team _____ Semester *Fall 2017* SIM (Circle) 1 2 3 Date of SIM_____

Rater_____

On a scale of 1 to 7, *where 1 is never and 7 is always*, please rate each task in way that would best represent individual's behavior throughout the entire flight simulation.

Never ***Sometimes*** ***Always***

1 2 3 4 5 6 7

1. _____ Resolves all the maintenance issues in the most effective way.
2. _____ Accurately estimates delay time for repairs.
3. _____ Effectively document repairs to an aircraft while using the RMS and the MEL.
4. _____ Effectively handles all the scheduled repairs while dealing with unexpected issues.
5. _____ Prioritizes work as needed.
6. _____ Operates in accordance to FAA regulations (e.g., does not properly follow all procedures outlined in the Minimum Equipment List for each applicable inoperative item).
7. _____ **Information Flow**: Shares relevant information as needed with other team members.
8. _____ **Information Utilization:** When appropriate, actively solicits information from key team members in order to arrive to best quality decisions.
9. _____ **Coordination:** Coordination with other team members is effective. (Proper phraseology/Efficient communication channels are always used.)

Individual Performance Measure – Hub Coordinator

Team _____ Semester *Fall 2017* SIM (Circle) 1 2 3 Date of SIM_____

Rater_____

On a scale of 1 to 7, *where 1 is never and 7 is always*, please rate each task in way that would best represent individual's behavior throughout the entire flight simulation.

Never ***Sometimes*** ***Always***

1 2 3 4 5 6 7

1. _____ Effectively identifies flights departing for a hub location that will be delayed more than 40 minutes.
2. _____ Reroutes leftover passengers and cargo in an efficient manner.
3. _____ Efficiently reroutes bumped and/or delayed passengers and cargo (i.e., uses Universal E-Lines flights when possible.
4. _____ Leaves passengers or crews unnecessarily stranded.
5. _____ Is resourceful in helping the team deal with passenger, crew, and cargo issues.
6. _____ **Information Flow**: Shares relevant information as needed with other team members.
7. _____ **Information Utilization:** When appropriate, actively solicits information from key team members in order to arrive to best quality decisions.
8. _____ **Coordination:** Coordination with other team members is effective. (Proper phraseology/Efficient communication channels are always used.)

Appendix E

I-ADAPT

This survey asks a number of questions about your preferences, styles, and habits at work. Read each statement carefully. Then, for each statement indicate the number that best represents your opinion. There are no right or wrong answers.

1 = Strongly Disagree
2 = Disagree
3 = Neither Agree nor Disagree
4 = Somewhat Agree
5 = Strongly Agree

1. I am able to maintain focus during emergencies
2. I usually over-react to stressful news
3. I believe it is important to be flexible in dealing with others
4. I take responsibility for acquiring new skills
5. I tend to be able to read others and understand how they are feeling at any particular moment
6. In an emergency situation, I can put aside emotional feelings to handle important tasks
7. I see connections between seemingly unrelated information
8. I enjoy learning new approaches for conducting work
9. I think clearly in times of urgency
10. I feel unequipped to deal with too much stress
11. I am good at developing unique analyses for complex problems
12. I am able to be objective during emergencies
13. My insight helps me to work effectively with others
14. I am easily rattled when my schedule is too full
15. I usually step up and take action during a crisis
16. I need for things to be ‘‘black and white’’
17. I am an innovative person
18. I make excellent decisions in times of crisis
19. I become frustrated when things are unpredictable
20. I am able to make effective decisions without all relevant information
21. I am an open-minded person in dealing with others
22. I take action to improve work performance deficiencies
23. I am usually stressed when I have a large workload
24. I am perceptive of others and use that knowledge in interactions
25. I often learn new information and skills to stay at the forefront of my profession
26. I often cry or get angry when I am under a great deal of stress
27. When resources are insufficient, I thrive on developing innovative solutions
28. I am able to look at problems from a multitude of angles
29. I quickly learn new methods to solve problems

30. I tend to perform best in stable situations and environments
31. When something unexpected happens, I readily change gears in response
32. I try to be flexible when dealing with others
33. I can adapt to changing situations
34. I train to keep my work skills and knowledge current
35. I am continually learning new skills for my job
36. I perform well in uncertain situations
37. I take responsibility for staying current in my profession
38. I adapt my behavior to get along with others
39. I easily respond to changing conditions
40. I try to learn new skills for my job before they are needed
41. I can adjust my plans to changing conditions

Table 1.
Definitions of the Eight Dimensions of Adaptive Performance

Dimension Title	Dimension Definition
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.
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.
Solving Problems Creatively	Employing unique types of analyses and generating new, innovative ideas in complex areas; turning problems upsidedown 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.
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.

Table 1 cont.

Definitions of the Eight Dimensions of Adaptive Performance cont.

Dimension Title	Dimension Definition
Learning Work Tasks, Technologies, and Procedures	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.
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.
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.
Demonstrating 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.

Table 1. Adapted from: Adaptability in the workplace: Development of a taxonomy of adaptive performance (p. 617), by E. D. Pulakos, S. Arad, M. A. Donovan, & K. E. Plamondon, 2000, Journal of Applied Psychology, 85(4), 612-624.

APPENDIX F: IRB APPROVAL

IRB
INSTITUTIONAL REVIEW BOARD
Office of Research Compliance,
010A Sam Ingram Building,
2269 Middle Tennessee Blvd
Murfreesboro, TN 37129

MIDDLE TENNESSEE STATE UNIVERSITY

IRBN007 – EXEMPTION DETERMINATION NOTICE

Monday, May 14, 2018

Investigator(s): Katie Poole; Michael Hein
Investigator(s') Email(s): Kbp3p@mtmail.mtsu.edu; michael.hein@mtsu.edu
Department: Psychology

Study Title: Adaptability and Decision Making Under Stress in the Workplace
Protocol ID: **18-1264**

Dear Investigator(s),

The above identified research proposal has been reviewed by the MTSU Institutional Review Board (IRB) through the **EXEMPT** review mechanism under 45 CFR 46.101(b)(2) within the research category *(4) Study involving existing data* A summary of the IRB action and other particulars in regard to this protocol application is tabulated as shown below:

IRB Action	EXEMPT from furhter IRB review***	
Date of expiration	NOT APPLICABLE	
Participant Size	Existing Data	
Participant Pool	**De-identified exisiting data from ID# 17-2008**	
Mandatory Restrictions	Only de-identified data from approved protocol 17-2008 my be accessed/analyzed	
Additional Restrictions	None at this time	
Comments	None at this time	
Amendments	**Date**	**Post-Approval Amendments** None at this time

***This exemption determination only allows above defined protocol from further IRB review such as continuing review. However, the following post-approval requirements still apply:

- Addition/removal of subject population should not be implemented without IRB approval
- Change in investigators must be notified and approved
- Modifications to procedures must be clearly articulated in an addendum request and the proposed changes must not be incorporated without an approval
- Be advised that the proposed change must comply within the requirements for exemption
- Changes to the research location must be approved – appropriate permission letter(s) from external institutions must accompany the addendum request form
- Changes to funding source must be notified via email (irb_submissions@mtsu.edu)
- The exemption does not expire as long as the protocol is in good standing
- Project completion must be reported via email (irb_submissions@mtsu.edu)

- Research-related injuries to the participants and other events must be reported within 48 hours of such events to compliance@mtsu.edu

The current MTSU IRB policies allow the investigators to make the following types of changes to this protocol without the need to report to the Office of Compliance, as long as the proposed changes do not result in the cancellation of the protocols eligibility for exemption:

- Editorial and minor administrative revisions to the consent form or other study documents
- Increasing/decreasing the participant size

The investigator(s) indicated in this notification should read and abide by all applicable post-approval conditions imposed with this approval. Refer to the post-approval guidelines posted in the MTSU IRB's website. Any unanticipated harms to participants or adverse events must be reported to the Office of Compliance at (615) 494-8918 within 48 hours of the incident.

All of the research-related records, which include signed consent forms, current & past investigator information, training certificates, survey instruments and other documents related to the study, must be retained by the PI or the faculty advisor (if the PI is a student) at the sacure location mentioned in the protocol application. The data storage must be maintained for at least three (3) years after study completion. Subsequently, the researcher may destroy the data in a manner that maintains confidentiality and anonymity. IRB reserves the right to modify, change or cancel the terms of this letter without prior notice. Be advised that IRB also reserves the right to inspect or audit your records if needed.

Sincerely,

Institutional Review Board
Middle Tennessee State University

Quick Links:

Click here for a detailed list of the post-approval responsibilities.
More information on exmpt procedures can be found here.