Decision Making on the Labor and Delivery Unit: An Investigation of Influencing Factors

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Objective: The aim of this study was to describe the relationship between negative affect (NA), decision-making style, time stress, and decision quality in health care.

Background: Health care providers must often make swift, high-stakes decisions. Influencing factors of the decision-making process in this context have been understudied.

Method: Within a sample of labor and delivery nurses, physicians, and allied personnel, we used self-report measures to examine the impact of trait factors, including NA, decision-making style, and perceived time stress, on decision quality in a situational judgment test (Study 1). In Study 2, we observed the influence of state NA, state decision-making style, state time stress, and their relationship with decision quality on real clinical decisions.

Results: In Study 1, we found that trait NA significantly predicted avoidant decision-making style. Furthermore, those who were higher on trait time stress and trait avoidant decision-making style exhibited poorer decisions. In Study 2, we observed associations between state NA with state avoidant and analytical decision-making styles. We also observed that these decision-making styles, when considered in tandem with time stress, were influential in predicting clinical decision quality.

Conclusion: NA predicts some decision-making styles, and decision-making style can affect decision quality under time stress. This is particularly true for state factors.

Application: Individual differences, such as affect and decision-making style, should be considered during selection. Training to reduce time stress perceptions should be provided.

Keywords: naturalistic decision making, health care, stress, individual differences

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INTRODUCTION

Health care is characterized by limited time, uncertainty, high stakes, and resource constraints. Owing in part to these challenges, the health care industry has struggled to attain consistent high-quality, error-free patient care (Berwick, Nolan, & Whittington, 2008). Although the contributors to health care error are multifaceted, one antecedent to low error rates is high-quality decision making (Hines, Luna, Lofthus, Marquardt, & Stelmokas, 2008; Reyna & Lloyd, 2006). Therefore, it is important to identify the contextual factors that influence decision quality so that these factors may be mitigated or augmented accordingly.

The purpose of this paper is to investigate the role of three such factors in the context of a labor and delivery (L&D) unit: negative affect (NA), decision-making style, and time stress. The current study utilizes a two-study, mixed-methods approach, looking at decision-making processes through both self-report (Study 1) and observational (Study 2) methods. We leverage trait activation theory (Tett & Burnett, 2003), wherein we examine both trait (Study 1) and state (Study 2) individual differences as influencing factors of decision making. To this end, we begin with a discussion of naturalistic decision making (NDM).

NDM

Traditional approaches to understanding decision making, based on classical decision-making theory and rational economic models (Buchanan & Huczynski, 2004), assume that decision makers seek to optimize the outcomes of their choices using clear criteria, options, and values. However, as most of this research has

been conducted in controlled settings (Lipshitz, Klein, Orasanu, & Salas, 2001), these theories have weaknesses when applied to decision making in real life (Beach & Lipshitz, 1993). Most decision making in the workplace—and particularly in health care—occurs under conditions of uncertainty and risk, which goes beyond what classical decision-making models can offer (Patel, Kaufman, & Arocha, 2002). NDM (Klein, 1993), proposes that due to situational constraints, decision makers cannot always weigh all options; rather, they make most of their decisions without considering alternatives (Kaempf, Wolf, & Miller, 1993).

Although several decision-making models fall under the NDM framework (Lipshitz, 1993), the recognition prime decision (RPD) model can be considered the prototypical NDM model for expert decision making. RPD acknowledges that experts making decisions select appropriate actions based on the situation, whereby they engage in three processes: (a) situation assessment, whereby they assess the situation using previous experiences; (b) serial option evaluation, whereby they retrieve plausible responses to the situation until a satisfactory one is identified; and finally, (c) evaluating the adequacy of the response by mentally simulating the outcome of a chosen option (Simpson, 2001). Although decision makers follow this trajectory, individual difference factors may affect response evaluations. For example, a decision maker who has an analytical decision-making style may be more cautious in the serial-option-evaluation phase, whereas an intuitive decision maker may place more emphasis on previous experiences (Nygren, 2000).

In sum, NDM provides the appropriate theoretical foundation to investigate decision making in health care. Specifically, NDM methods allow for investigation of the content and structure of clinicians' decision-making processes and their relationship with contextual information, such as the environment and patient outcomes (Fonteyn & Ritter, 2000). Numerous factors influence the way people scan the environment, assess options, and make choices. Influencing factors (Harte & Koele, 1997), including barriers that exist throughout the decision-making path (Orasanu & Connolly, 1993), require examination.

Factors Influencing Decisions in Health Care

We explore three influencing factors that could potentially affect decision making in health care: NA, decision-making style, and time stress. Although decision making under stress has been examined in several high-stakes contexts (Cannon-Bowers & Salas, 1998; Driskell & Salas, 1991; Kowalski-Trakofler, Vaught, & Scharf, 2003), relatively little work has addressed the influences of these specific factors on decision making in a clinical setting.

Importantly, we make distinctions between *trait* and *state* factors. Trait factors are stable, whereas state factors are more task specific and variable over time (Chen, Gully, Whiteman, & Kilcullen, 2000). Prior theory has suggested that state factors mediate the relationship between trait factors and performance (Kanfer, 1990, 1992). That is, situational demands help to elicit traits and thereby influence performance by cuing situationally appropriate attitudes, cognitions, and behaviors (states). Along these lines, trait activation theory (Tett & Burnett, 2003) posits an interaction between traits and situation, such that situational features either elicit or hinder the display of traits. More specifically, situations cue the relevance of particular traits. This theory aligns with the NDM framework, which explains how decision-making processes are affected by situational demands.

Whereas some factors are solely trait (e.g., cognitive ability) or state (e.g., task-specific self-efficacy) factors, others can be influenced by both trait factors and state situational demands. For example, research has shown that affect is largely stable across the lifespan but also has intraindividual variability due to situational demands (Rocke & Brose, 2013). Similarly, the literature has examined stress from both a trait perspective (vulnerability to perceptions of stress; Szalma, 2009) and a state perspective (stressors, such as time, etc.; Hancock & Warm, 1989). Furthermore, decision-making style can be both a trait (one's tendency to be an analytical, intuitive, or avoidant decision maker)

and a state (such that environmental demands may force a particular decision-making style upon a decision maker).

Theory suggests that state factors are more proximal in relationship to performance outcomes in comparison to trait factors (Kanfer, 1990, 1992), and empirical research has supported this theory (Chen et al., 2000). Therefore, it is possible that trait and state factors have differential relationships with decision outcomes. As such, we examine both trait factors using self-report measures and simulated decision scenarios (Study 1) and state factors using observational data from real-life work processes (Study 2).

NA. The affect infusion model (Forgas & George, 2001) proposes that affect can affect the outcome of a situation by influencing cognitions and, in turn, behaviors. Specifically, it posits that affect is an essential antecedent to decision making (Forgas & George, 2001), as affect provides information about how to behave in a situation (Schwarz, 1990). Furthermore, affect influences judgments through cognitions (Forgas & George, 2001). This occurs in two ways: (a) the process of thinking (i.e., the extent to which one weighs pre-existing knowledge vs. new information) and (b) the content of thinking (i.e., what kind of information one uses to arrive at a decision). Similarly, the cognitive psychology literature proposes theories, such as the affect-as-information hypothesis (Clore & Storbeck, 2006) and the affect regulation model (Winkielman, Knutson, Paulus, & Trujillo, 2007), that consider the role of affect in decision making. These theories suggest that affective responses interact with cognitive evaluations of decision alternatives, which together drive a decision maker's behavior (Abramson et al., 2002; Aikins & Craske, 2001; Alloy et al., 2000; Borkovec, 1994; Gotlib et al., 2004; Gotlib, Yue, & Joormann, 2005).

Generally, there are considered to be two primary types of affect: *positive affect* (PA), defined as a tendency to have pleasant feelings (e.g., enthusiasm, excitement), and *NA*, defined as a tendency to have unpleasant feelings, such as irritability and grouchiness (Cropanzano, Weiss, Hale, & Reb, 2003). These two types of affect do not exist in a single spectrum; rather, a person can be high or low on both PA and NA (Cropanzano et al., 2003). Of particular interest in the current study is the role of NA in decision making, as NA has been shown to increase the accessibility of negative thoughts and memories (Aikins & Craske, 2001; Borkovec, 1994; Roemer & Orsillo, 2002), a greater negative expectation about the future, and suboptimal problem solving (Ward, Lyubomirsky, Sousa, & Nolen-Hoeksema, 2003).

Moreover, the appraisal tendency framework (Lerner & Keltner, 2000, 2001) suggests that the impact of NA on information processing is dependent on one's emotional state. For example, anger elicits heuristic processing, attention to superficial cues, minimal data collection, and risk taking. Contrastingly, fear and anxiety has been linked with integrative information processing, whereby decision makers take fewer risks and tend to integrate all pieces of information in a systematic and thorough manner (e.g., Bodenhausen, Sheppard, & Kramer, 1994; Chaiken, Liberman, & Eagly, 1989; Lerner & Tiedens, 2006; Loewenstein & Lerner, 2003).

Thus, NA likely affects one's *decision-making style*, that is, the habitual pattern individuals use when gathering and perceiving information for a decision (Driver, 1979; Harren, 1979; McKenney & Keen, 1974; Scott & Bruce, 1995). According to Nygren (2000), there are three styles: analytical (i.e., considering numerous details and alternatives), intuitive (i.e., deciding based on one's gut feeling), and avoidant (i.e., attempting to avoid making a decision). During time-stressed situations, decision makers do not tend to use effortful, deliberate decision-making strategies (Klein, 1996), such as analytical decision making. Instead, they tend to make rapid, recognition-primed decisions (Cohen & Freeman, 1997). However, because situations in health care can vary on a continuum from routine to emergent, and as stress vulnerability is an individual difference, it is likely that all three decision-making styles are represented in health care.

Those high on NA are reluctant to commit to solutions (Ward et al., 2003), tend to avoid decisions, and prefer low-risk options (Isen & Means, 1983). Similarly, when high-NA individuals are faced with a decision, they tend to recall mood-congruent memories, which preclude rational or analytical decision processes (Gotlib et al.,

2004). Such individuals are unlikely to engage in intuitive decision making, because such intuition-guided behavior is inconsistent with high NA. Rather, NA is likely to result in avoidant tendencies, which negates the presence of intuitive behavior (Borkovec, 1994; Roemer & Orsillo, 2002). Furthermore, neuroticism—a personality trait related to NA (Matthews & Falconer, 2000)—predicts avoidant decision-making style (Riaz, Riaz, & Batool, 2012). As such, we hypothesize the following:

Hypothesis 1a: NA will have a negative relationship with analytical decision-making style.
Hypothesis 1b: NA will have a negative relationship with intuitive decision-making style.
Hypothesis1c: NA will have a positive relationship with avoidant decision-making style.

Decision-making style. Decision-making style, especially in complex environments, affects decision quality (Cannon-Bowers & Salas, 1998). Research has shown that use of an avoidant decision-making style is associated with poor decision quality (Ferrari & Dovidio, 2000; Nygren, 1997; Nygren & White, 2002, 2005). However, using intuitive and analytical decision-making styles has been found to lead to substantially better performance (Nygren & White, 2002, 2005). As such, we predict the following:

Hypothesis 2a: Analytical decision-making style will be positively related to decision quality.
Hypothesis 2b: Intuitive decision-making style will be positively related to decision quality.
Hypothesis 2c: Avoidant decision-making style will be negatively related to decision quality.

Time stress. *Stress*, defined as "a process by which certain environmental demands . . . evoke an appraisal process in which perceived demand exceeds resources and results in undesirable physiological, psychological, behavioral, or social outcomes" (Salas, Driskell, & Hughes, 1996, p. 6), can cause decision errors (Cannon-Bowers & Salas, 1998; Janis & Mann, 1977). Whereas environmental stressors may be quantified (e.g., amount of noise, time allotted for task completion; see Hancock & Warm, 1989), stress perceptions vary between individuals (Lazarus & Folkman, 1984). That is, two people enduring the same stressors may experience different relative levels of stress (Szalma, 2009). Therefore, stress is not simply a set of conditions but, rather, a perceptual state that occurs as a person appraises his or her environment (Hockey, 1986; Lazarus, 1999; Lazarus & Folkman, 1984; Salas et al., 1996).

Time stress results when demands are perceived to be disproportionately high in relation to the time allotted for completion (Kinicki & Vecchio, 1994) and greatly hinders decision processes (Lehner, Seyed-Solorforough, O'Connor, Sak, & Mullin, 1997). Time stress has a divergent magnitude of impact on performance, depending on individual differences (Revelle, Amaral, & Turriff, 1976). Consequently, it is important to identify the influence of time stress on decision making when considering the individual differences that may affect this process.

Attention narrows during high stress (Combs & Taylor, 1952; Easterbrook, 1959), limiting focus to stimuli of interest (Keinan & Friedland, 1987). Therefore, during time-stressed situations, an intuitive decision approach will likely yield optimal results (Klein, 1993, 1996; Nygren & White, 2002). Under time stress, an analytical approach may be harmful because it uses valuable time to filter all information (Kelly, 1966). In other words, an adequate decision that is made quickly will be better than the best decision that is made too late (see Flin, Slaven, & Stewart, 1996). When time stress is low, however, it is likely that the best decision-making style will depend more on the features of the problem. For routine problems, an intuitive decision may be suitable; however, when the patient is high risk, when a clinician is inexperienced, or when the problem is rare, an analytical style may be most appropriate (Nygren & White, 2002). Therefore, we hypothesize the following:

Hypothesis 3a: Time stress will moderate the relationship between analytical decision-making style and decision quality, such that analytical decision-making style will be less

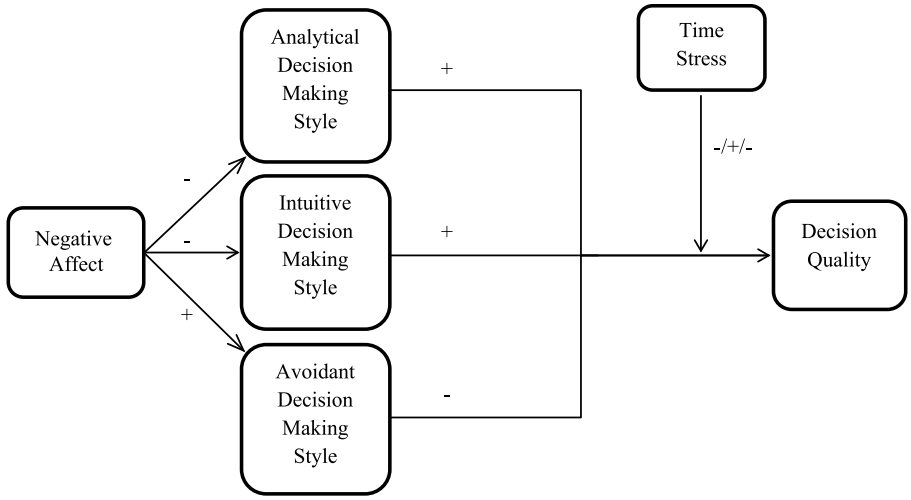

Figure 1. Hypothesized model of decision quality. Signs on the arrows indicated expected direction of effect. The three signs on the time-stress arrow indicate the expected direction of the moderation effect for each of the three decision-making styles (analytical, intuitive, and avoidant, respectively).

positively related to decision quality as time stress increases.

Hypothesis 3b: Time stress will moderate the relationship between intuitive decision-making style and decision quality, such that intuitive decision-making style will be more positively related to decision quality as time stress increases.

Avoidant decision making, on the other hand, is likely almost always a suboptimal approach. Often, outcomes will occur whether or not a decision is made. Outcomes are more likely to be positive when decisions are made as needed rather than avoided. Avoidant decision making is likely most harmful and ineffective when time stress is high, because time stress tends to be a characteristic of emergencies in which decisions must be made (Kelly, 1966). In time-stressed situations, therefore, avoidant decision-making styles may hinder decision quality. Avoidant decision-making styles may be especially harmful in complex environments where delays in decisions can be fatal (e.g., the L&D). Thus, we hypothesize the following:

Hypothesis 3c: Time stress will moderate the relationship between avoidant decision-making style and decision quality, such that avoidant decision-making style will be more negatively related to decision making quality as time stress increases.

Figure 1 summarizes our hypotheses.

STUDY 1

Method

Sample. The sample consisted of 40 L&D clinicians and staff at a large, Level 1 trauma hospital in the southeastern United States. Participants were mostly female (97.5%) and represented registered nurses (67.5%), nurse managers (15%), licensed practice nurses (10%), resident physicians (5%), and clinical educators (2.5%). Participants indicated having worked on the unit for less than 1 year (15.4%), 1 to 5 years (28.2%), 5 to 10 years (20.5%), 10 to 15 years (7.7%), 15 to 20 years (7.7%), or 20 or more years (20.5%). Participants indicated working the day shift (70%), the night shift (25%), or both shifts (5%). Because the hospital unit was small, we categorized age using 4-year age ranges from 20 to 70+ (e.g., 20–24, 25–29) to preserve confidentiality. The most frequently reported age ranges were 30 to 34 ($n = 9$; 22.5%)

and 50 to 54 (n = 8; 20%). This research was approved by the institutional review boards (IRBs) of the University of Central Florida and of the participating hospital.

Procedure. Participants attended a study information session at shift-change meetings. Participants then individually met with a researcher who did not work for the hospital and signed informed-consent forms if they agreed to participate.

To maintain confidentiality, surveys were anonymous and submitted separately from informed-consent forms.

Measures. Four measures were employed: (a) trait NA, (b) trait decision-making style, (c) decision quality, and (d) trait time stress.

(a) Trait NA. We used a 10-item self-report measure from the Positive and Negative Affect Schedule (Watson, Clark, & Tellegen, 1988; α = .86). Respondents reviewed a list of adjectives describing various negative feelings and emotions (e.g., *distressed, guilty*) and rated the degree to which they generally feel the corresponding affect on a 5-point Likert scale (1 = *a very little extent* and 5 = *a very great extent*).

(b) Trait decision-making style. We used Nygren's (2000) 45-item Decision Making Inventory. Participants responded to each item on a 6-point Likert scale (1 = *strongly disagree* to 6 = *strongly agree*). Analytical (e.g., "In making decisions, I first try to make a mental list of all the factors or attributes that will be important to my decision"; α = .91), intuitive (e.g., "I can get a good 'feeling' for most decision situations very quickly";α = .85), and avoidant (e.g., "I sometimes spend too much time hesitating before making decisions"; α = .78) decision-making styles were assessed with 15 items each.

(c) Decision quality. We developed an eight-scenario situational judgment test (SJT; see Table 1 and online supplemental material). To increase realism, instructions asked participants to imagine themselves encountering the scenarios during a regular shift on their unit. After each scenario, participants were given a list of between six and 10 actions that they could decide to take and were asked to rank-order them according to their importance (1 = *most important* to 10 = *least important*).

Three experienced nurse subject matter experts (SMEs) assisted in SJT development. One obstetric clinical expert reviewed and edited the content of the scenarios and response options, and two nurses came to consensus regarding the appropriate rank order of response options to each item. Decision quality was assessed by calculating a distance score between the rank order of the options provided by the experts and that given by the participant. A lower score on this measure indicated higher performance, with 0 (meaning no deviation from the expert rank order) representing a perfect score. Scores were averaged across the scenarios in order to provide a total decision quality score. The internal consistency of the SJT was assessed by Cronbach's alpha, resulting in a coefficient of .53. However, SJTs do not tend to have strong internal consistencies (see Ployhart & Ehrhart, 2003) potentially due to the heterogeneity between scenarios (Prewett, Brannick, & Peckler, 2013).

(d) Trait time stress. Trait time stress was measured with the four-item Time Pressure subscale of Matteson and Ivancevich's (1987) Stress Diagnostic Survey (α = .93). Items asked participants to rate their perceived time pressure at work on a 5-point Likert scale (1 = *never* to 5 = *always*). A sample item is "I have to rush in order to complete my work duties."

Analyses. Seven participants were excluded from the analyses because their data were incomplete; therefore, data from 33 participants were used. Analyses were conducted using SPSS Version 23. Hypotheses were tested using simple linear regression and multiple regression. Unless otherwise specified, all hypothesis tests are one tailed to account for our directional hypotheses.

Results

Descriptive statistics and correlations for each of the variables are listed in Table 2.

Results for Hypotheses 1a through 1c are presented in Table 3. For these analyses, we ran three separate linear regressions, wherein trait NA was the predictor and trait decision-making style was the dependent variable (DV). This approach was used instead of discriminant analysis as theory suggests that each of the subtypes of decision-making style is unrelated to one another, such that a person can be high or low on all three, rather than having only one decision-making style.

TABLE 1: Situational Judgment Test Sample Scenario and Response Options

Scenario	Response Options
"Jenny is a 24-year-old G2 P0 going into labor. Jenny's cervix was dilated to 4 cm about 20 minutes ago. She says her contractions are getting stronger and closer together, so you decide to connect her to a fetal monitor. Once it is in place, you are having difficulty getting a fetal heart rate."	____ Continue monitoring the patient carefully before her scheduled delivery ____ Check Jenny's vital signs ____ Perform a vaginal exam ____ Ask the patient about a history of spontaneous abortions ____ Ask another nurse to assist you with the fetal monitoring to make sure you are getting an accurate reading ____ Contact the resident and attending physician immediately ____ Initiate emergency C-section procedures ____ Check fetal position as a reason for inaccurate readings ____ Prepare a magnesium sulfate infusion ____ Contact the charge nurse and relay your situation

Note. Response options were rank-ordered according to importance by participants, whereby 1 = *most important* and 10 = *least important*. G2= Gravida 2 (indicating that the patient has had two pregnancies); P0 = Para 0 (indicating that the patient has had zero births). Directions read, "For the following scenarios, please provide a rank order of the appropriate actions based on their level of importance, in the order that you would conduct them in response to the situation. While answering, imagine yourself encountering these scenarios during a normal shift at [name of hospital] within the unit where you currently work. After reading the situation below, please rank-order the provided actions according to their importance to the situation where 1 = most important and 10 = least important."

TABLE 2: Descriptive Statistics and Correlations for Study 1 Measures

Variable	*M*	*SD*	1	2	3	4	5	6
1. Trait negative affect	1.96	0.56	(.86)					
2. Trait time stress	2.70	0.80	.49**	(.93)				
3. Trait analytical decision making	4.67	0.56	–.24	–.39*	(.91)			
4. Trait intuitive decision making	4.23	0.53	–.06	.01	.18	(.85)		
5. Trait avoidant decision making	3.59	0.58	.42*	.05	–.04	.01	(.78)	
6. Decision quality	14.38	2.72	–.26	–.30*	–.09	.07	.13	(.53)

Note. $N = 33$. Values in parentheses are reliabilities.
*$p < .05$. **$p < .01$.

Hypothesis 1a stated that NA is negatively related to analytical decision-making style. Neither the overall model, $F(1, 34) = 2.10$, $R^2 = .06$, $p = .16$, nor the predictor, $t = –1.45$, $\beta = –.24$, $p = .08$, was statistically significant for trait factors. The effect size was small ($f^2 = .06$). Thus, Hypothesis 1a was not supported for trait factors.

In Hypothesis 1b, we suggested that NA would be negatively related to intuitive decision-making style. The data showed no significant effect for either the model, $F(1, 34) = 0.11$, $R^2 = .00$, $p = .75$, or the predictor, $t = –0.33$, $\beta = –.06$, $p = .37$, for trait factors. The effect size was null ($f^2 = .00$). Thus, Hypothesis 1b was not supported for trait factors.

TABLE 3: Relationships Between Trait Negative Affect and Trait Decision-Making Style

Dependent Variable	*F*	R^2	*t*	β	*p*
Trait analytical decision making	2.10	.06	–1.45	–.24	.08
Trait intuitive decision making	0.11	.00	–0.33	–.06	.37
Trait avoidant decision making	7.32	.18	2.71	.42	<.01

TABLE 4: Relationships Between Trait Decision-Making Style and Decision Quality

Variable	*t*	β	*p*
Trait analytical decision making	–0.50	–0.09	0.31
Trait intuitive decision making	0.47	0.09	0.64
Trait avoidant decision making	0.66	0.12	0.26

Note. $F(3, 29) = 0.30$, $R^2 = .03$, $p = .82$. Dependent variable = decision quality, represented by deviation from expert situational judgment test score; thus, a lower score indicates higher decision quality.

Hypothesis 1c stated that NA would be positively related to avoidant decision-making style. There was a significant positive relationship between trait NA and trait avoidant decision making, $F(1, 34) = 7.32$, $R^2 = .18$, $p = .01$; $t = 2.71$, $\beta = .42$, $p < .01$, supporting Hypothesis 1c for trait factors. The effect size was medium ($f^2 = .22$).

Hypothesis 2 concerned the relationship between decision-making style and decision quality. For this analysis, we ran one multiple regression with the three decision-making styles as predictors and decision quality as the DV. The overall model was not significant, $F(3, 29) = 0.30$, $R^2 = .03$, $p = .82$. See Table 4. The effect size was small ($f^2 = .03$).

In Hypothesis 2a, we predicted that analytical decision-making style would be positively related to decision quality. This predictor was not significant, $t = –0.50$, $\beta = –.09$, $p = .31$, disconfirming Hypothesis 2a for trait factors.

In Hypothesis 2b, we predicted that intuitive decision making would positively predict decision quality. However, this relationship was not significant for trait factors, $t = 0.47$, $\beta = .09$, $p = .64$.

Furthermore, Hypothesis 2c stated that avoidant decision making would be negatively related to decision quality. This hypothesis was not supported for trait factors, $t = 0.66$, $\beta = .12$, $p = .26$.

In Hypothesis 3, we predicted that time stress would interact with decision-making style to affect decision quality. For this hypothesis, the predictors and moderator were centered because 0 was not a plausible score. Hypothesis 3 was tested by entering the centered predictors (trait analytical decision making, trait intuitive decision making, trait avoidant decision making), the centered moderator (trait time stress), and the interaction of each centered trait decision-making style variable with centered trait time stress as predictors of decision quality into a regression model. The overall model was not significant, $F(7, 25) = 1.69$, $p = .16$, $R^2 = .32$, for the trait factors. However, the effect size was large ($f^2 = .47$).

In Hypothesis 3a, we suggested that time stress would moderate the relationship between analytical decision making and decision quality, such that analytical decision making would be more negatively related to decision quality as time stress increased. This hypothesis was not supported for trait factors (i.e., the interaction was not significant, $t = –0.51$, $\beta = –.29$, $p = .61$; see Table 5). However, we found that centered trait time stress was a significant predictor of decision quality ($t = –2.15$, $\beta = –1.06$, $p = .04$; see Table 5), such that higher trait time stress was associated with a lower decision difference score, indicating a higher-quality decision. In Hypothesis 3b, we tested the idea that time stress would interact with intuitive decision making to affect decision quality, such that intuitive decision making was more positively related to decision quality as time stress increased. This hypothesis was not supported for the trait factors, as the interaction was not significant

TABLE 5: Moderation of Trait Time Stress on Trait Decision-Making Style and Decision Quality

Variable	*t*	β	*p*
Trait analytical decision making (centered)	–0.10	–0.06	.92
Trait intuitive decision making (centered)	–0.34	–0.15	.74
Trait avoidant decision making (centered)	–1.69	–0.80	.10
Trait time stress (centered)	–2.15	–1.06	.04
Trait Time Stress × Trait Analytical Decision Making	–0.51	–0.29	.61
Trait Time Stress × Trait Intuitive Decision Making	0.52	0.30	.61
Trait Time Stress × Trait Avoidant Decision Making	2.17	1.19	.04

Note. $F(7, 25) = 1.69$, $p = .16$, $R^2 = .32$. Dependent variable = decision quality, represented by deviation from expert situational judgment test score; thus, a lower score indicates higher decision quality.

($t = 0.52$, $\beta = .30$, $p = .61$; see Table 5). In Hypothesis 3c, we predicted that time stress would moderate the relationship between avoidant decision-making style and decision quality. Specifically, we hypothesized that avoidant decision making would be more negatively related to decision quality as time stress increased. This hypothesis was supported for the trait factors ($t = 2.17$, $\beta = 1.19$, $p = .04$; see Table 5).

To better understand the interaction between trait avoidant decision making and trait time stress, we dichotomized trait time stress into low (scores below the mean of 2.7, $n = 14$) and high groups (scores above the mean, $n = 19$). The regression with low trait time stress was not significant, $F(1, 12) = 2.01$, $p = .18$. However, the regression with high trait time stress was significant, $F(1, 17) = 6.32$, $p = .02$. In addition, we graphically examined this interaction (see Figure 2). As predicted, trait avoidant decision-making style was negatively related to decision quality when trait time stress was high.

STUDY 2

In Study 1, we found that trait NA predicted trait avoidant decision making and that, in turn, trait avoidant decision making interacted with high trait time stress to produce lower-quality decisions on an SJT. Contrary to our hypotheses, we did not find significant relationships between trait NA and trait analytical or trait intuitive decision-making styles. Similarly, we failed to find relationships between analytical and intuitive decision-making styles, trait time stress, and SJT decision quality.

To determine the extent to which the hypothesized relationships occurred when considering state factors and real clinical decisions, which should theoretically have stronger relationships (Kanfer, 1990, 1992), we undertook Study 2 using observational data. We propose the following research questions:

Research Question 1: Is state NA related to state decision-making styles, and will it lead to a positive or negative impact on state decision-making styles?

Research Question 2: Are state decision-making styles related to the quality of decisions individuals make, and will they lead to a positive or negative impact on decision quality?

Research Question 3: Will state time stress affect the relationship between state decision-making style and decision quality differently, such that it will lead to either a stronger or weaker relationship?

Method

Sample. The sample consisted of L&D clinicians and staff at a large, Level 1 trauma hospital in the southeastern United States. Specifically, we observed physicians (including ob-gyns and anesthesiologists), nurses, allied health providers (e.g., midwives), and unit staff (e.g., secretaries). This research was approved by the IRBs of the University of Central Florida and of the participating hospital.

Procedure. Five authors of the manuscript served as observers, and a majority were blinded to the hypotheses of the study until after observations.

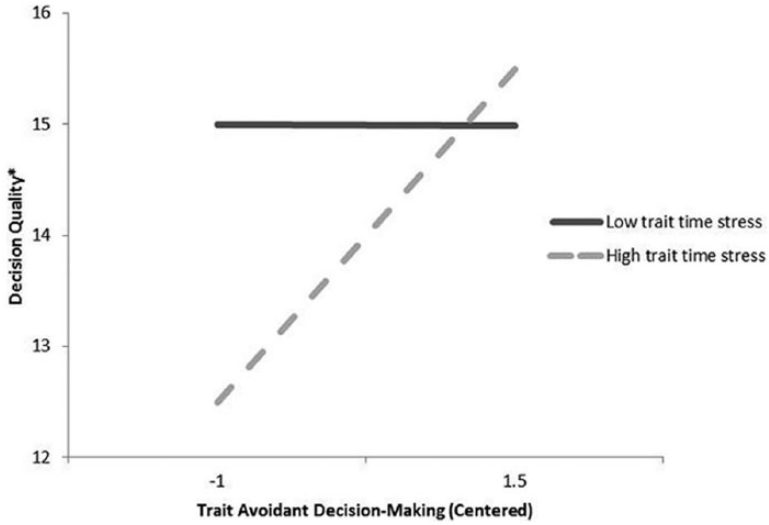

Figure 2. Interaction between trait avoidant decision-making style and trait time stress. The dependent variable is decision quality. Because the decision quality score was calculated using the distance between the expert ranking and the participant ranking, a lower score indicates a higher decision quality.

Observers' backgrounds included organizational behavior, industrial-organizational psychology, and human factors psychology. Observers first attended observer training attended by a doctorally trained, experienced nurse who provided input on clinical and contextual issues. Observers were instructed to record in writing all situations in detail and to code any cues that indicated potential patient problems (e.g., fetal heart distress), including who recognized the cue (to be provided as a job title, such as "nurse"; no names were permitted), the source (e.g., machine information, patient complaint), and the salience (i.e., high or low) of the cue. Observers were also instructed to describe the monitoring (e.g., "checked fetal heart rate every 5 minutes") and deliberation (e.g., "showed fetal heart rate tracings to charge nurse to obtain input") processes that the clinician(s) engaged in.

Furthermore, observers were instructed to describe the decision that was made; in particular, they were asked to state whether the staff member decided to alert somebody (e.g., "nurse called resident"), whether they decided to wait and/or monitor the situation, or whether they decided to take action to treat the patient. Observers were asked to indicate the time these decisions were made to allow for an understanding of how the decision-making process unfolded. This procedure allowed observers to determine the extent to which a decision was made intuitively, made analytically, or avoided. Furthermore, observers were instructed to code contextual information and barriers that affected decision making (e.g., patient issues, clinician issues, equipment issues, environmental issues). Additionally, observers were trained to describe details regarding the ultimate decision that was made (e.g., "delivered via emergency C-section"), including the nature of the decision (planned/routine or unplanned/emergency) and the outcome for the mother and for the baby (positive or adverse).

Observers then collectively spent 40 hr on the unit, during both day and night shifts, in pairs. Observations were semistructured such that observers had protocols; however, observers also relied heavily on an open-ended field notes section. Observations were conducted within all areas of the L&D unit (e.g., triage, nurse's station, patient rooms, and the operating room). Patient and staff identities remained confidential. Observers scanned and typed up notes as soon as possible after completing an observation shift so that they would not forget the meaning of any notes or details. After typing up individual notes, observer pairs integrated notes so that

situations were portrayed with as much detail and accuracy as possible.

Measures. Four measures were employed: (a) state NA, (b) state decision-making style, (c) decision quality, and (d) state time stress.

(a) State NA. Behaviors indicative of state NA (including verbal cues; language, tone of voice) were coded, using previous work on observing NA as a guide (i.e., Butler & Geis, 1990; Patterson, Gardner, Burr, Hubler, & Roberts, 2012; see Table 6). Because situations varied widely on the appropriateness of display of NA and the use of these nonverbal indicators, each situation was analyzed based on context. For instance, we did not consider lack of eye contact to be an indicator of NA while a clinician was engaged in suturing a patient during a Cesarean section, as eye contact during such a scenario would remove focus from the task and endanger the patient and, as a result, would not be expected.

(b) State decision-making style. State analytical decision-making style was characterized by staff considering multiple pieces of information and/or various options, either verbally (e.g., asking numerous questions) or nonverbally (e.g., checking patient charts, vitals, lab tests). Additionally, we considered staff to be engaging in an analytical decision-making style when they deliberated with another staff member (e.g., a nurse asking for a second opinion on a fetal heart tracing). State intuitive decision-making style was operationalized as staff making rapid or uncommunicated decisions without explicitly considering numerous pieces of information or deliberating options. State avoidant decision-making style was characterized by inaction or staff hesitation to make a decision or take action when necessary.

(c) Decision quality. We observed decision quality by watching and notating the decisions that participants made and determining whether they resulted in a positive or adverse outcome. When information necessary to make this determination was unclear, we clarified with the staff and asked for follow-up details. As observers did not have a clinical background, two nurse SMEs reviewed all coding for decision quality, and changes were made as they deemed necessary.

(d) State time stress. We noted the context of situations in order to determine the extent to which state time stress was present. In particular, we coded whether actions were hurried or rushed as well as any comments made by clinicians indicating that they were under time stress (e.g., "We need to hurry").

Results

In Research Question 1, we sought to determine whether state NA related to state decision-making style and whether it would lead to a positive or negative impact on state decision-making style. We observed that there was an impact of state NA on decision-making style particularly for analytical and avoidant decision making. Specifically, we found that there was a tendency for the relationship between state NA and state analytical decision making to be negative, such that low state NA seemed to encourage state analytical decision making. To further iterate, during one exemplar surgical procedure, the mood in the room was light, and the clinicians made friendly small talk among each other and with the patient—indicating low state NA (Patterson et al., 2012). The nurse was monitoring vitals and taking detailed notes throughout the procedure. Toward the end of the procedure, the nurse asked the physician to confirm whether the patient needed to be on bed rest. The physician also conducted a detailed ultrasound to ensure that the procedure had been performed successfully. Another pattern that we observed was that when the team leader and team members had low state NA, the team spoke up more and explicitly asked more questions to inform their decisions.

We found numerous examples of high state NA being related to state avoidant decision making. During one surgical procedure, the physician suggested performing additional procedures. However, the physician seemed to just subtly provide the suggestions but then avoided making the decision by leaving the ultimate choice to go through with the proposed decision to the nurse. Subsequently, the physician was irritated and complained about a missing surgery sheet. This behavior indicates that perhaps avoidant decision making influenced state NA and not the other way around. In another instance, the secretary informed a nurse that a patient had called. The nurse hesitated, indicating that he or she would go see the

TABLE 6: Behaviors Indicating State Negative Affect

Butler & Geis (1990)	Patterson, Gardner, Burr, Hubler, & Roberts (2012)
Lack of eye contact	Behaviors directed at members
Eye gaze up	Eye contact/looking behavior
Eye gaze down	Lack of smiling
Body posture	
Body movement	
Displeased	
Aggressive	

patient in a minute (indicative of avoidant decision making). The nurse complained, expressing dislike when patients call when "all they need is ice" (indicating NA). In another situation, a physician answered the telephone. In an annoyed tone of voice (representative of NA), the physician asked the caller what was wanted. When the caller responded, the physician avoided the situation (avoidant decision making) by stating that he or she was busy in a delivery and had already answered the caller's question earlier that day.

In Research Question 2, we sought to determine whether state decision-making styles were related to decision quality and whether they would lead to a positive or negative impact on decision quality. Our observational findings lend credence to the relationship between state analytical decision making and decision quality. For example, during every surgery we witnessed, there was a great degree of situation monitoring (e.g., checking vitals), and the clinicians asked multiple questions of the patient (e.g., "Do you have any allergies?" "Are you numb?"). Collecting such information allowed for more informed and, thus, higher-quality decisions. Even when patients did not speak English, clinicians went above and beyond in order to ensure they were still obtaining the details they needed from the patient in order to make the appropriate decision.

Our observations also provided several examples of state intuitive decisions being related to high decision quality. When quick intuitive decisions were appropriate and necessary, they were also positively related to decision quality. For example, during two different surgical procedures, alarms were going off on the machines that were attached to the patient. They were responded to quickly by the clinicians. In both of these cases, the outcome was positive.

We also observed examples of avoidant decision making being related to poor decision quality. In one instance, a patient was in labor and pushing for over an hour due to delays in decision making. At several points, the midwife looked concerned. The doctor checked in the room and said if they needed anything, he or she would be nearby, then left the room. The doctor came and left the room two additional times due to phone calls and other demands. When the patient was finally ready to deliver, she struggled to push the baby out. Last-minute additional interventions (e.g., vacuum) had to be used in order to get the baby out, and an emergency Cesarean section was narrowly avoided. Although the mother and baby were ultimately OK, the baby was born with the cord wrapped around his or her neck, and the mother required stitches. Thus, in this case, state avoidant decision making was related to a somewhat negative outcome.

Finally, in Research Question 3, we sought to determine whether state time stress affects the relationship between state decision-making style and decision quality differently, such that it leads to either a stronger or weaker relationship. In our observations, we witnessed an example of state time stress interacting with state analytical decision making to predict decision quality. In this case, a preterm patient who had a special condition was going into organ failure. A group of clinicians got together to analyze the situation for over 20 min in order to make a decision. The clinicians discussed waiting 3 days to deliver, as doing so would be beneficial for the baby. They seemed to indicate that they were under a moderate amount of time stress, by stating that this type of situation happens and that the organ would not suffer more damage by waiting 3 days; yet, the baby needed to be delivered preterm, before the organs underwent further failure. Ultimately, this combination of high analytical decision making coupled with time stress proved to be unsuccessful, as the patient had concerning blood pressure spikes 2 days later and had to deliver earlier than planned.

Finally, one observation that was particularly salient for illustrating the interaction between

high state intuitive decision making and state time stress, as well as low state avoidant decision making and state time stress, is as follows: A patient who was slowly progressing through labor began to have fetal heart rate decelerations—an indicator of an emergency. Clinicians quickly decided that the baby needed to be delivered immediately, indicating intuitive decision making, and rapidly began to prepare the patient for emergency Cesarean section. The baby was delivered safely, and both mother and baby were healthy. In this instance, clinicians were low on avoidant decision making and high on intuitive decision making because they rapidly decided that the baby needed to be delivered and acted on this decision without hesitancy.

GENERAL DISCUSSION

Our self-report results of trait factors in Study 1 showed that trait NA predicted trait avoidant decision making. However, trait analytical and trait intuitive decision-making style were not related to trait NA. In addition, our self-report data in Study 1 showed that trait decision-making styles were not significant predictors of decision quality on their own; however, when considered in tandem with trait time stress, significant effects emerged for avoidant decision making, in that those high on both trait avoidant decision making and time stress had poor decision quality.

Findings from Studies 1 and 2 are summarized in Table 7. As can be seen, our observations of state factors (Study 2) conflicted with some of our nonsignificant self-report findings of trait factors (Study 1). For example, we observed many examples of a positive relationship between state analytical decision making and decision quality, whereas this relationship was not significant with our trait data. Similarly, when state time stress was high, we observed state intuitive decision making as a precursor to positive decision outcomes, although these effects were not present in our self-report trait data. One finding common to both studies is that of NA being associated with avoidant decision making.

Our two-study approach allowed us to gain a clearer perspective on the NDM processes that occur in this context and permitted us to examine both trait and state influencing factors of decision making. Our results largely aligned with trait activation theory (Tett & Burnett, 2003) and the operationalization of individual difference factors as traits versus states, in that situations seemed to elicit the manifestation of particular states when we observed real-life situations, whereas our self-report trait data were not as predictive. Perhaps the context of the situation is necessary to elicit manifestations of the influencing factors. This interpretation aligns with NDM theory, which posits that the decision-making process in a real-life situation differs largely from decision-making processes in controlled environments (Beach & Lipshitz, 1993).

Limitations and Future Research

As with any study, some limitations existed in our studies. First, our survey sample size was small (n = 33). However, our sample represented over half (55%) the clinicians on the unit (N = 60), on par with survey response rates in organizational research (52.7%; Baruch & Holtom, 2008). Furthermore, we observed almost the entire unit across a series of day and night shifts. Another limitation is that the self-report data were cross-sectional, as practical constraints and privacy concerns precluded them from being longitudinal. Finally, this study was done within the context of an L&D unit. The extent to which these findings generalize to lower-stakes populations is unknown.

As stated, there were instances in which a relationship that was not confirmed in Study 1 was observed in Study 2. In addition to this result being a function of true differences between trait and state factors, there are also potential methodological factors. First, the self-report data in these analyses may be a result of Type II error. Our survey sample represented a large portion of the clinicians on the unit; nevertheless, the number of respondents limits power. This explanation seems particularly likely for analyses that were marginally significant in the predicted direction, for example, Hypothesis 1a. In addition, it is possible that the self-report data are accurate in that our hypotheses are truly unsubstantiated. In this case, the observed data would have to be confounded, a low base-rate phenomenon, or incorrect due to observer bias. Because we had two observers for

TABLE 7: Summary of Results for Studies 1 and 2

Question	Trait: Self-Report (Study 1)	State: Observational Data (Study 2)
1. Is NA related to decision-making style?	Was trait NA negatively related to analytical decision-making style? No, approached significance.	• Under conditions of low NA (friendly small talk among team and with patient), nurse took detailed notes and asked for physician confirmation. Physician conducted detailed ultrasound to confirm patient was OK to send to recovery. • Under conditions of low NA, team members spoke up more and asked more questions.
	Was trait NA negatively related to intuitive decision-making style? No	• Behaviors not manifested during observation period to contextualize this relationship.
	Was trait NA positively related to avoidant decision-making style? Yes	• Physician subtly provided suggestions but avoided making a decision. Seemed irritated. • Nurse hesitated to check on patient, seemed annoyed at patient request. • Physician answered phone in annoyed tone of voice, avoided answering a question about a patient, stating he or she was busy and already answered it earlier.
2. Are decision-making styles related to decision quality?	Was trait analytical decision-making style positively related to decision quality? No	• Situations in which clinicians asked many questions were associated with positive outcomes.
	Was trait intuitive decision-making style positively related to decision quality? No	• When alarms on patient machines went off, clinicians reacted swiftly. These situations were associated with positive outcomes.
	Was trait avoidant decision-making style negatively related to decision quality? No	• Physician slow to respond to midwife concerns about patient. Last-minute interventions had to be used, and baby born with cord wrapped around neck; mother required stitches.
3. Will time stress affect the relationship between decision-making style and decision quality?	Did trait time stress moderate the relationship between analytical decision-making style and decision quality? No	• Mother was undergoing organ failure but baby was preterm. Patient had blood pressure spikes and had to deliver earlier than planned.
	Did trait time stress moderate the relationship between intuitive decision-making style and decision quality? No	• Clinicians were quick to make a decision and did not avoid doing so when a patient showed signs of fetal distress. Baby was delivered via emergency Cesarean section, and mother and baby were healthy.
	Did trait time stress moderate the relationship between avoidant decision-making style and decision quality? Yes	

Note. NA = negative affect.

each observation, and external clinical SMEs' input on decision coding, we find these observation bias explanations unlikely. Further, it is notable that our sample compositions varied between the two studies; in Study 1, most participants were nurses, whereas in Study 2, we observed a wider range of professions. Although this variation may have contributed to differences, our observed sample also comprised many nurses, thus making this explanation less likely. Further, it is possible that the differences in the stakes of the two studies affected our results. Study 1 utilized simulated decisions with no real consequences; however, Study 2 involved real decisions. Although we are unable to analytically disentangle these various artifacts, we have strong theoretical rationale to believe that our findings are driven largely by true differences between trait measures and situational state measures.

In terms of future research, it would be ideal to study the effects of experience and knowledge on decision-making styles and decision quality, as experts make decisions differently than novices (Salas, Rosen, & DiazGranados, 2010). Although we did collect such data via self-report methods, we could not connect this information to our observations due to privacy concerns.

Implications

Theoretical implications. Previous NDM research has largely focused on the impact of time stress on analytical and intuitive strategies, wherein it precludes analytical and facilitates intuitive decision making. Our study suggests that rapid decision-making models, such as the RPD model (Klein, 1993), should begin to also incorporate avoidant decision making.

Additionally, this study has implications for understanding the role of affect in NDM. The appraisal tendency framework (Lerner & Keltner, 2000, 2001) suggests that NA affects information processing and decision making. Our results partially confirm this theory, in showing that NA was associated with a higher avoidant decision-making style. Authors of future research should look at which specific emotions (e.g., anger, fear) predict avoidant decision making, as emotions of the same valence can differentially affect information processing (Lerner & Keltner, 2000, 2001).

Another unique contribution of this study is the integration of NDM with trait activation theory (Tett & Burnett, 2003). We found that state factors appear to be more related to decision quality in comparison with trait factors. This finding shines light on the need to better distinguish between trait and state factors in future research, both conceptually and operationally. One potential barrier to this research is that whereas trait factors are amenable to being measured by cross-sectional self-report measures, state factors are typically more difficult to measure, requiring timely measurement approaches (e.g., multiple self-report measures, experience sampling methods, physiological measures) and/or qualitative methods. As such, there is a dearth of studies collecting both quantitative and qualitative data. Yet, collecting both trait and state data enriches the story and provides additional avenues for future research on more nuanced decision-making issues. Although limitations exist, doing so is an important step to better understand dynamics of NDM, particularly in the health care setting, which can be difficult for human factors and other applied psychology researchers to access.

Practical implications. There are implications of this research to both selection and training contexts. First, this research suggests that practitioners should begin to consider looking at NA and avoidant decision making in the selection process. However, as the results of this study rest on a sample from one industry, these relationships should be confirmed in additional studies before these practices are adopted by an organization. Additional robust research should be conducted to validate these constructs as predictors of decision quality.

In addition, our results have implications for organizational training. Klein (1996) recommends that organizations do not train employees to adopt more analytical decision-making strategies; rather, he claims, they should train employees to handle time pressure by utilizing metacognitive strategies. Thus, we recommend that organizations train employees to engage in analytical decision-making processes when time stress is low but to teach them to use appropriate intuitive decision-making processes in situations when time is limited. Over the course of one's experi-

ences, one can perform highly using intuitive decision-making strategies (Klein, 1996). In summary, acknowledging the complexity of decision making and its interaction with contextual boundaries is a necessity to maximize positive health care outcomes.

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KEY POINTS

- Negative affect predicts avoidant decision-making style.
- Decision-making style and time stress interact such that decision quality is poor when one is high on both avoidant decision-making style and high on time stress.
- Relationships were seen between both analytical and intuitive decision making and time stress on decision quality in observations of real clinical decisions; however, these relationships were not supported in self-report data.
- State factors appear to have more of an impact on decision quality in comparison with trait factors.

SUPPLEMENTAL MATERIAL

Supplemental material for this article is available with the manuscript on the *Human Factors* website.

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