Employee Error: The Development, Validation, and Use of a Perceived Error Measure for Predicting Rumination, Burnout, and Counterproductive Work Behaviors

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Errors are ubiquitous in organizations. Nonetheless, scholarly literature regarding workplace error has largely focused on low-rate catastrophic failures such as the Challenger, Columbia, and Chernobyl accidents. However, errors are not always large in scale nor rare. A general measure of perceived error will be useful for industries that want to understand the relationship between employee error and important job-related outcomes such as rumination, burnout, and counterproductive work behaviors (CWBs). In order to better understand this area, we created and validated a perceived error scale (PES) on a general population of full-time workers. Study one consisted of 440 observations collected via MTurk. An exploratory factor analysis was conducted on 60 percent of the data, and a confirmatory factor analysis was conducted on the remaining sample. Based on psychometric analysis, we determined that perceptions of error were consistent with three established categories of error: individual, latent, and planning errors. Study two utilized a cross-sectional design consisting of 314 observations. SEM was used in this study to test a sequential mediation model. The results suggested that how an individual perceives error may impact rumination, burnout, and CWBs. Both the relationship between latent errors and CWBs were mediated by rumination and burnout. Similarly, the

relationship between individual errors and CWB was mediated by rumination and burnout. Planning errors were not related to any of the downstream variables in the model.

This is consistent with goal progress theory and the stressor-emotion model of CWB. Notably, the PES factor structure was replicated in the second study adding to its reliability evidence. Future research may consider taking a more longitudinal approach to measuring perceptions of error, burnout, rumination, and CWBs.

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CHAPTER 1: INTRODUCTION

Everyone errs at work. Some errors are common and easy to recover from while other errors are significant and have costly implications for those involved. For example, one report suggests that medical errors cause 44,000 – 98,000 deaths every year in the United States, resulting in $17 - $29 billion in additional costs each year (Corrigan, et al., 2000; Seys et al., 2012). Considerable research on human error inspired by nuclear accidents, such as the notorious three-mile island focuses on *preventative* measures for error, e.g., systems engineering; consequently, less is known about individual-level factors that may impact the culpable individuals. Much of the research that does examine adjustment following error comes from the medical industry, inspired by Albert Wu's 2000 article where he coined the phrase "second victim" (Seys, 2012).

Initial research on second victims documents symptoms of anxiety and depression following errors (Jones et al., 2013; Sirriyeh et al., 2010; West, et al., 2009; West et al., 2006). These studies establish precedent and justify the need for future research regarding the negative psychological adjustment that may follow erring. Even though many of these studies are qualitative in nature, the results are consistent with goal progress theory (Martin & Tesser, 1996), which suggests elevated levels of rumination may occur after failure to attain a goal. Extending goal progress theory, the researcher proposes that burnout and rumination may mediate the relationship between error and counterproductive work behaviors (CWB) (Smoktunowicz, et al., 2015). Thus, our research will expand on current findings in the second victim literature by incorporating (a) a psychometrically sound measure of perceptions of error, (b) goal progress theory, and (c) mediating (i.e., ruminative thinking) factors. Together, this will

provide a better understanding of how individuals react to workplace errors by isolating mechanisms through which employees may be at risk for higher levels of burnout or CWBs.

While the one focus of this research project is to document burnout and CWBs following error in the workplace, a valid tool to assess the perception of error is needed. Consequently, this project will have two main components: (a) the development and validation of the survey tool (i.e., study one) and (b) the use of the tool to explore the consequences of perceived error (i.e., study two). The two research studies will collectively inform an under-researched component of the error management theory (Frese & Keith, 2015): how the individual-level perception of error impacts recovery from error.

Study One: Survey Development and Validation.

The purpose of study one was to develop and validate a measure of perceived error in the workplace. A valid and reliable tool will provide researchers the opportunity to research and discover how the perception of error influences psychological adjustment. To serve a variety of fields, a non-industry specific measure of perceived error was developed. Consequently, this tool can be applied in different industries to measure individual differences following error regardless of occupation. A three-factor solution was originally proposed to comprehensively measure the perception of error. The first factor consists of cognitive-related items such as, "My decision resulted in an error." These items will measure planning errors. The second factor is behavioral in nature and consists of items regarding the failure to execute a pre-specified plan. The third factor will measure the degree to which an individual considers the system to play a role in their error (as opposed to isolating the responsibility to the individual). The three-factor approach broadly characterizes features and consequences of error, allowing for a comprehensive, yet multi-faceted approach to determine which specific perceptions of error may

influence psychological adjustment. Ultimately, a four-factor solution was settled on after a fourth factor, "general culpability" emerged where all the negatively worded items loaded together.

After exploring the factor structure of the questionnaire, the researcher validated the measure by examining the relationship between the perceived error scale and several related psychological constructs. The correlation between the perceived error scale, agreeableness, conscientiousness, and locus of control were used to establish convergent and divergent validity. Latent error was negatively related to individual error, planning error, general culpability, and work locus of control. Lastly, as an additional measure of divergent validity, the relationship between the measure of perceived error and the propensity for social desirability bias was examined. None of the subfactors for the perceived error scale were significantly related to social desirability.

Study Two: Psychological Adjustment.

Study two replicated the results of study one and further added to the predictive validity of the scale by utilizing a cross-sectional design to investigate psychological adjustment following error in accordance to control theory (Carver & Scheier, 1982), goal progress theory (Martin & Tesser, 1996) and the stressor-emotion model of CWB (Spector & Fox, 2005). A sequential mediation model was used to test the hypothesis that different perceptions of error will result in differing levels of burnout, rumination, and counterproductive work behaviors., explanatory variables such as ruminative thinking were expected to predict poorer psychological adjustment following an error (i.e., burnout and rumination) which in turn should relate to higher rates of counterproductive work behaviors (CWBs).

The results suggested *how* an individual perceives error may impact rumination, burnout, and CWBs. Both the relationship between latent errors and CWBs were mediated by rumination and burnout. Similarly, the relationship between individual errors and CWB was mediated by rumination and burnout. Planning errors were not related to any of the downstream variables in the model. This is consistent with goal progress theory and the stressor-emotion model of CWB (Spector & Fox, 2005). Notably, the PES factor structure was replicated in the second study adding to its reliability evidence. Future research may consider taking a more longitudinal approach to measuring perceptions of error, burnout, rumination, and CWBs.

Implications for Theory and Practice

The development of a perceived error measure provides researchers a tool to continue research on error in the workplace and the opportunity to extend goal progress theory to the error management literature. Additionally, the scale is useful for researchers who need to assess how error impacts the productivity and health of employees. Results from this study provide initial evidence of the relationship between rumination and employee strain, in the form of burnout, after erring at work.

CHAPTER 2: STUDY ONE: SCALE DEVELOPMENT AND VALIDATION

Errors are ubiquitous in organizations. Nonetheless, scholarly literature regarding workplace error has primarily focused on low-rate *catastrophic* failures such as the Challenger, Columbia, and Chernobyl accidents (Hoffman & Frese, 2011). However, errors are not always large in scale or rare. Consider spreadsheets, where research has found that 0.9% to 1.8% of all formula cells in worksheets contain errors (Powell, et al., 2009) and up to 40 percent of all spreadsheets contain errors (Hofmann & Frese, 2011). Many of these errors can be identified and corrected quickly. Still, failure to identify seemingly small errors can result in major financial loss.

The term error is abundant in everyday language and most individuals seem to have an intuitive understanding of what it is. However, in the literature, defining error is more complex. For example, many considered terms like "violations" or "mistakes" to be synonymous with error. Yet, the literature specifically differentiates violations and mistakes from error (Reason, 1990). The following three sections of this chapter will discuss a definition of error, a typology of error types, and what error is not. Following an overview of error, the researcher will propose a survey to measure perceptions of workplace error (i.e., whether the error was behavioral, planning, or systemic in nature). Lastly, we will explore adverse events (i.e., psycho-social, financial, or physical *consequences*) as a related facet of error. Note that it is essential to consider adverse events because reactions to workplace errors do not occur in a vacuum separate from consequences. Thus, broad characteristics of consequences that constitute an adverse event will also be explored and a second survey to measure these broad characteristics will be presented.

Defining Error.

Reason defines error as "the failure of a planned action to be completed as intended or the use of a wrong plan to achieve an aim without the intervention of an unforeseen event" (Reason, 1990, p. 6). Hoffman and Frese (2011) dissect this definition by highlighting three important aspects which characterize an error:

1) An error is a deviation or failure to achieve a goal.

2) An error is an *unintentional* deviation.

3) An error is avoidable.

Recently, the error literature shifted from an exclusive focus on error prevention to error management. Initially, following horrific nuclear accidents, researchers reactively focused on how to prevent errors from happening in the first place. Whereas error prevention is concerned with stopping errors from happening, error management accepts that errors occur and focuses on how to respond after an error (Frese & Keith, 2015). This research proposal is informed by both Reason's definition of error and the error management literature, while concerning itself with individual maladaptive adjustment following an error in the workplace.

Deviation or failure to achieve a goal.

As can be seen in Reason's (1990) definition, the conceptualization of error often includes some mention of a failure to successfully complete an action. Failure to complete an action may transpire through different mechanisms. For example, error can either be the result of failure to *plan* appropriately or failure to *execute a plan* appropriately. Thus, actions as errors can only be evaluated in the context of the intention (or conceptualized plan) (Reason, 2013).

Unintentional deviation.

In addition to failing to achieve a goal, an error must be an *unintentional* deviation. The purpose of highlighting an error as *unintentional* serves to differentiate errors from violations. Violations, unlike errors, are the opposite of unintentional in that for an action to constitute a violation, there must be a deliberate *deviation* from a preset plan. Initially, an intentionally deviation may sound counterintuitive: why would an employee knowingly deviate from a plan? One such example is when an employee may intentionally deviate from a plan either to pursue a "higher order goal" or to achieve the goal in a different way (Freese & Hofmann, 2011). For example, an employee may skip a quality check in order to meet a goal of finishing a product on time. It is important to note that either unintentional deviations (error) or violations (intentional deviation) may result in adverse outcomes which is focused more on the consequences of events (i.e., something bad happened) rather than the cause of the event (i.e., was it an error or was it an intentional deviation/violation?). Furthermore, errors do not necessarily result in adverse event; at times errors can result in learning or innovation (Lei et al., 2016). Although learning from error is an important aspect to research, the focus on this proposal is on maladaptive reactions to error.

Avoidable

Finally, the error should be avoidable. This is not to be confused with *unintentional* which suggests that the action was not planned or premeditated. Avoidable suggests that the outcome could have been foreseen and thus avoided. (Freese & Hoffman, 2011, pg. 4). This suggests that with all the same information and environmental constraints, the same outcome would have occurred; there was nothing the actor could do to prevent it.

Consider for example, the insurance classification, "act of God" (Kaplan, 2007). For example, one individual had a family of squirrels living in his car. The squirrels ate through the wiring in his car to the point where the car no longer operated efficiently and required repair. After evaluating the car, the insurance company determined he was not at fault and filed it under, "act of God." This unavoidable characteristic is an interesting aspect of the definition of human error which may have fueled the literature's early focus on error *prevention*, as opposed to error management. Reasonably, if human errors do not arise due to some chance agency, then there must be a way to isolate, predict, and prevent human error with various techniques (Stanton & Stevenage, 1998).

Types of Error.

Early critics of error taxonomies considered them to be too coarse, however their critique was based on the assumption that it would be used to predict future errors. Specifically, when these taxonomies first emerged, the focus of error research was inspired by horrendous accidents like Three-Mile Island (Reason, 1990). Accordingly, much of the research concerned itself with preventing grievous human error to avoid the loss of human life. This was particularly the case with nuclear plants where human error could result in consequences lasting generations.

However, this preoccupation with preventing error did not address what to do in the event of errors actually take place. Here a taxonomy is immensely useful for surveying a broad range of errors. This conceptualization can help identify antecedents of different individual psycho-social consequences of error. Our scale is largely inspired and framed by three types of errors: action errors, planning errors, and latent errors (Table 1).

Table 1: *Typology of Errors*

Error Category	Example	Illustration
Endogenous to the Individual		
Action Error	Lapses	An employee forgets to complete a routine check on a procedure that is very familiar to them.
	Slips	An employee performs a routine check on the wrong machine part.
Planning Error	Thought errors	A project manager did not think to consult key stake holders before implementing a new process. After implementing the process it becomes evident that the new process has major downstream implications that had not been previously considered, but could have if the project manager involved key stakeholders.
Exogenous to the Individual		
Latent Error	Systems design	Two similarly named vials are adjacent to each other and have different effects on the human body. As a result, healthcare providers have higher than normal medical errors rates on the unit (i.e., administering the wrong medication)

Broadly, the three types of errors focused on this presentation can fall into one of two categories: exogenous and endogenous. Endogenous errors are an error made at the individual level (a specific person makes an error due to their own cognitions/behaviors). Endogenous errors can take on a variety of characteristics: action errors (e.g., slips and lapses) and planning errors (e.g., mistakes). While slips are errors of execution (i.e., action), mistakes are errors in the formation of a plan (i.e., cognitive) (Senders & Moray, 1991; Reason, 1990). Exogenous errors, however, are a facet of the whole system. Conditions for an exogenous error usually result from decisions made that impact the system. Eventually, those decisions or rules combine with other factors that result in an error. (Reason, 1990, Woods et. al., 2017).

This broad classification may be helpful for error management. For example, endogenous (i.e., individual-level) errors may require the organization to focus on the individual. Meanwhile, exogenous errors (i.e., system-level errors) may require the organization to consider redesigning the system or implementing new policies or rules (Senders & Moray, 1991). For example, a nurse is repeatedly making mistakes due to external stresses in their personal life may need additional support or time off (e.g., action error; endogenous to the individual). Alternatively, nurses on a unit who repeatedly administer the wrong medication because two vials are placed next to each other (i.e., substitution error) (Methangkool, 2022) and have similar names may not need individual-level interventions so much as the organization needs to reorganize vials or the pharmaceutical company could redesign the packaging to clearly delineate which vial is which (e.g., exogenous to the individual; system level error).

Frequently, exogenous errors require an in-depth analysis that may be time and resource intensive. It may be easier to attribute error to the individual rather than consider the moving and multifaceted complexities in a system that may contribute to an error taking place. Take for example, the Air Ontario Flight 1363 Accident. The aircraft took off in poor conditions. The pilot *uncharacteristically* took off in the poor conditions (temperatures hovering at freezing and precipitation).; the aircraft barely became airborne before crashing and burning less than one kilometer beyond the runway. Initial inquiry may attribute the error to the pilot (i.e., he should not take off in poor conditions). However, the Canadian federal government investigated the incident for nearly two years resulting in over 200,000 pages documenting how the airport was managed, "the air transportation system, its organization, and its regulation" (Woods, 2017, pg. 53). The report concluded that over 30 factors at both individual and system level contributed to the accident including:

- Poor weather
- Poor management in the airline
- Deferred maintenance items, including the inability to de-ice a plane in Dryden nor the ability to restart engines (which would be required before de-icing the plane).
- Need to refuel in Dryden - due to weight limits fuel was removed and despite the pilots' desire to leave the passengers instead.
- Pilots decision to take off in poor conditions.

As can be seen from the list, a wide variety of conditions and individual errors lead to adverse events which take an incredible amount of time and resources to investigate. It is important to keep these in mind when researching error and its impact on the individual.

What Error Is Not.

Violations (previously described) and risks are not errors. As previously described, violations are *intentional* deviations from a goal-oriented plan. This deviation is a conscious decision, whereas errors are not (Lei, et al., 2016). This often occurs in organizations when lower-level goals are sacrificed in the pursuit of a higher-order goal (Freese & Hofmann, 2011). For example, an employee may skip a safety protocol step to accomplish a task faster. The decision to skip a safety procedure is a violation committed in order to accomplish the task faster thus meeting a higher order goal.

The Driving Behavior Questionnaire (Parker, et. al., 1995) provides also provides a relatable example which differentiates errors (e.g., slips, lapses, and planning) from violations. Violations consist of knowingly driving under the influence or deliberately ignoring speed limits. Alternatively, slips consisted of items like failing to see a new stop sign on a regular route and

lapses consisted of items like forgetting where one's car is parked or driving to a different destination than intended (Senders & Moray, 1991; Reason, 1990).

Risks are also not considered errors. Risks characterize actions taken following a conscious decision and can be describe with the premise "with the same information, I would have made the same decision." The actor evaluates the information they have and makes a decision as to what they believe will result in the best outcome. Provided with the same conditions – they would have made the same decision each time. This is important to note because errors must be avoidable. If, with all the same information the same decision would have been made, then the action or plan was *not* in the strictest sense avoidable and thus is not considered an error. However, *a miscalculated* risk is the condition where an individual errs in their assessment of the situation that lead them to pursue some plan or action. For example, returning to the Driving Behavior Questionnaire, there is an item for miscalculating the speed of an oncoming driver (Reason et al., 1990). Miscalculating the speed and turning into traffic is a failure to accurately assess the situation (i.e., the risk in the situation) and thus constitutes an error.

Perceived Error Scale.

A general measure of perceived error will be useful for industries that want to measure the perception of error and predict job-related outcomes (e.g., job satisfaction) as well as health-related outcomes (e.g., poor psychological adjustment following error). The *perception* of error is more relevant than the error itself, as the response of the individual is a function of their perception of an event rather than truth or reality (Lazarus, 1982). This perception is often influenced by needs and values (Shuler, 1980). For example, the need to be perfect may influence the perception of error and ultimately psychological adjustment. Thus, based on

previous definitions of error, which suggests error can be the result of failure to plan or failure to execute an action (e.g., Reason, 1990), and the importance of the *perception* of error (e.g., that the error was the result of systemic features and not solely the individual), the researchers propose that a three-factor conceptualization of perceived error will best fit the data: Planning errors, behavioral errors, and system errors (see Table 1). The first two factors are endogenous errors whereas the last factor is an exogenous error (also referred to in the literature as a latent error).

Factor One: Cognitive (Planning).

The first factor will consist of cognitive-related items and will measure error that are perceived to be related to planning (i.e., mistakes). Mistakes are called planning failures and include lapses in judgement or cognitive inference. While the plan is executed the way it was intended, the plan did not result in the intended outcome. Examples of cognitive-related items include, "If I had a more objective view, I would have seen a better plan," and "I was rushed and I made a mistake." Items were inspired by the categories developed by Reason (1990) (see Table 2 for proposed items).

Factor Two: Individual Behaviors (Slips, lapses)

The second factor will be behavioral in nature and will consist of items regarding the perception that the individual failed to execute a pre-specified plan. Examples of behaviorally related items include, "I meant to do something else," and "I thought someone else would do something, so I didn't do it." Again, items were inspired by the categories developed by Reason (1990) (see Table 2 for proposed items).

Factor Three: Latent Errors

The third factor will consist of items regard the individual's perception that the error was a result of the system or latent error (see Table 4). Each of these items tap into the complicated ways in which an error may happen at work. For example, "This event involved several levels of management."

Table 2: *Perceived Error Scale – Factor 1 Proposed Items*

Factor 1: Planning Errors (e.g., Deciding on the wrong course of action)
My decision resulted in mistakes
I didn't learn enough before making a plan.
If I had a more objective view, I would have seen a better plan
My planning is a reason for the error
My judgment caused an error
If I had had more time, I would have planned better
My lack of attention caused me to make the blunder
My lack of attention resulted in a bad decision
I was on autopilot and made a mistake
My lack of understanding caused me to make an error
I was rushed and I made a mistake
Lack of resources caused me to make a mistake
I made the wrong arrangements and made a mistake
The alternative I chose was wrong
I interpreted the situation incorrectly and made a mistake
I made the right decision (reverse score/item check)
I didn't communicate well enough which resulted in an error.
There was a misunderstanding between colleagues
I wasn't thinking about the long-term consequences
I missed classified the situation
I tried what worked in the past rather than what would work for the current situations.
I was confused by the situation and did the wrong thing.
I did the action because I thought something else would happen.
I didn't have the information required to make the right decision.

Table 3: Factor 2: Individual (e.g., Doing the Wrong Thing/Poor Execution)

Factor 2: Individual (e.g., Doing the Wrong Thing/Poor Execution)
I didn't do what I intended to do which contributed to my blunder
My actions were not consistent with my intention
I meant to do something else
I didn't do well enough
I did what I planned to do (reverse scored/item check)
I was on autopilot and did the wrong thing
I skipped a step which resulted in a blunder
I performed the action too quickly.
I forgot to follow up on something
I didn't follow up on someone so, they didn't do what they were supposed to do.
I thought someone else would do something, so I didn't do it.
I forgot to do one or more steps in a plan
I didn't have the knowledge required to perform appropriately.

Table 4: *Perceived Error Scale - Factor 3 Proposed Items*

Factor 3: Latent errors
There wasn't a quality control point and that contributed to my error.
Normally, this error wouldn't have happened, but external and internal factors lined up so the error would happen.
This event was years in the making.
This event involved several levels of management.
I am the only person responsible for this event (reverse scored)
It will likely take a long time and detailed research to identify what went wrong.

Validity. A construct-based method will be used to provide initial support for the validity of the perceived error scale. In an effort to identify validity checks, the researcher searched the literature for personality factors that correlate with workplace error or accidents. Conscientiousness and aggression emerged as personality factors with the most potential as a validity check (Cellar, et al., 2001; Clarke & Robertson, 2005; Clarke & Robertson, 2008; Wallace & Vodanovich, 2003).

Aggression. Aggression[1] appears to be the most consistent trait across different studies (Clarke & Robertson, 2008) and thus it is the most promising validity check for a perceived error scale which can be used across different situations. Even though the meta-analysis performed by Clarke and Robertson (2008) does not account for specific situational variables that may influence the relationship, the standard deviation of the correlation in different studies was low (.10) especially compared to other personality factors measured. The researchers hypothesized that "facets of [aggression] are associated with increased accident involvement, possibly due to higher emotional arousal and an inability to cooperate effectively with others. Given the likelihood of these conditions across situations, no moderation by context is expected" (Clarke & Robertson, 2005).

Conscientiousness. Previous research suggests a small to medium relationship may exist between accidents and conscientiousness (Wallace & Vodanovich, 2003) among undergraduate students and accidents (Cellar, et al., 2001) as well as both undergraduate students and employees and driving accidents (Arthur & Graziano, 1996). These results were further corroborated by Wallace & Vodanovich (2003) who found a small but significant ($r = -.17$, $p < .05$) relationship between conscientiousness in production workers in the southeastern United States and workplace accident. Lastly a meta-analysis of 17 studies (with a total of 47 articles) also found a relationship between conscientiousness and accidents (mean validity = .27)[2] (Clarke & Roberston, 2005). Consequently, we hypothesize that a negative relationship between levels of conscientiousness and the perceived error scale. Thus, the following hypotheses related to content validity are proposed:

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[1] Note: Clark & Robertson (2008) also refer to this as *low* agreeableness.
[2] Note, the authors transposed correlations (Clarke & Robertson, 2005).

Hypothesis 5: Aggression will be positively correlated with the perceived error scale.

Hypothesis 4: Conscientiousness will be negatively correlated with the perceived error scale.

Locus of Control. The proposed measure of perceptions of error may overlap with locus of control. There are three factors that are expected to emerge from the perceived error scale: action errors, cognitive/planning errors, and system/latent errors. Locus of control (from social learning theory), is a personality trait that indicates the degree to which a person feels that events result from his or her own agency (internal locus of control) or from agents outside of his or herself (external locus of control) (Rotter, 1954). Consequently, the following hypotheses are proposed:

Hypothesis 6: Action and planning errors will be positively related to internal locus of control.

Hypothesis 7: Latent errors will be positively related to external locus of control.

Social Desirability. As a last validity check, we will examine the relationship between social desirability and our perceived error scale. If our measure is positively related to social desirability, it may bias the results such that the relationship between error and outcomes is underestimated (Fischer & Fick, 1993) (Crowne & Marlowe, 1960).

Study One Methods.

Procedure.

Participants were recruited from Amazon's Mechanical Turk (MTurk). MTurk is an online crowdsourcing platform ideal for collecting survey data from a diverse population with minimal cost. The Perceived Error Scale was posted as a Human Intelligence Tasks (H.I.T.s) for "workers" to complete. Prior to participating in the study, participants signed an informed

consent. Contact information for the researchers was included at the beginning and end for the study along with an opportunity to provide feedback on the survey if desired. To maximize data quality of the study, participants were limited to those who have a 95% past performance rating and those who have already completed at least 500 H.I.Ts (Human Intelligence Tasks) as (Peer, Vosgerau & Acquisti, 2014). Furthermore, instructional manipulation checks were included to determine if the MTurk worker is attentive. For example, among Likert scale items the following question will be included: "Please respond 'Agree' if you are paying attention." Participants who do not respond 'agree' were excluded.

Participants.

Due to the diverse nature of the MTurk sample (Mason & Suri, 2012), specific inclusion criteria were set to maximize the control: (1) full-time employee, (2) working in the United States, (3) at least 18 years old, (4) recently experienced an error (past week). The resulting participant pool was reflective of the variety of workers who use MTurk. Consequently, the sample was more generalizable than the college student population traditionally relied upon by behavioral researchers.

Measures.

In total, participants were asked to complete 93 survey items and one open-ended questions in study 1 (excluding demographic questions). Table 5 presents all the scale names, associated number and item types that will be used in study 1. A description of each of the scales including reliability statistics is presented after Table 5.

Table 5: *Scales, Number of Items, Item Type*

Scale	Number of Items	Item Type
Perceived Error Scale	43	Likert (5-point scale)
Work experience	1	Continuous (Years of Experience)
Job Level	1	Single Select
Job Proficiency	1	Likert (7-point scale)
NEO-FFI Anger Hostility Scale	11	Likert
Mini-Marker: Conscientiousness	8	Likert (9-point scale)
Work Locus of Control Scale	16	Likert
Narrative Feedback	1	Open-Ended

The Perceived Error Scale. Initial items were developed based on a thorough review of the literature. These items were designed to map onto three factors: planning errors and action errors. See Table 2-4 for a list of initial items.

Error Severity. Participants were also be asked 11 questions regarding error severity. It was anticipated that these items will map onto three factors of error severity (i.e., emotional consequences, financial consequences, social consequences).

Demographics. In addition to work experience and proficiency, demographic measures such as gender, race, age, and educational attainment were included.

Work Experience/Proficiency. As a validity check, participants were asked to describe their experience at work in terms of years and proficiency: (1) How long have you worked in this field? (2) Please rate your level of proficiency at your job. For the second item responses were on seven-point Likert scale from extremely incompetent to extremely proficient.

Aggression. The IPIP analogue equivalent to the NEO-FFI anger/hostility consisted of 10 items: get angry easily, get irritated easily, get upset easily, am often in a bad mood, lose my temper, rarely get irritated, seldom get mad, am not easily annoyed, keep my cool, rarely complain (Goldberg, 2006).

Conscientiousness. Conscientiousness was measured with Saucier's Mini-Markers. Eight items will be used from the Mini-Marker to assess conscientiousness. The adjectives were rated on a 9-point scale. The scale ranged from extremely inaccurate to extremely accurate. The conscientiousness subscales both demonstrated acceptable reliabilities ranging from .86 to .83 respectfully (Saucier, 1994).

Locus of Control. The Work Locus of Control Scale (WLCS) contained 16 items measuring both internal (8 items) and external locus of control (8 items) in work settings and has acceptable reliability (α = .75-.85). Spector recommended a six-point Likert scale ranging from "disagree very much" to "agree very much" (Spector, 1988).

Narrative Feedback. Participants will be asked to describe briefly a recent mistake made at work with the following question: "Please think of the most recent mistake you made at work. Using 2-4 sentences, describe what happened and the outcome." The researchers used to this as a validity check to ensure the perceived error scale captures all relevant features of the perception of error.

Social Desirability. The Marlowe–Crowne Social Desirability Scale consists of 33 items. Respondents were asked to indicate whether the item is true or false for them. For example, a respondent will be asked whether "Before voting I through investigate the qualifications of all candidates." The inventory has acceptable reliability (.82-.89) (Crowne & Marlowe, 1960; Reynold, 1982).

Data Analysis Plan.

The data was screened for "Flatliners" and "speeders." Speeders consisted of respondents who completed the survey in less than half of the median response time. Flatliners consisted of those that answer questions the same way throughout a given scale (e.g., they always answer

"Strongly Agree" for scaled items). Lastly, opened responses were reviewed for those that provide nonsensical answers (e.g., “asdf”). The resulting clean dataset was randomly spilt in half. An exploratory factor analysis (EFA) was conducted on the first dataset and a confirmatory factor analysis (CFA) was conducted on the second dataset.

***Exploratory Factor Analysis*.** An exploratory factor analysis was implemented first as an exploratory approach to identify the number of factors to use in the subsequent CFA (Brown, 2015). An EFA approach was chosen in favor of a principal components analysis (PCA) for a variety of reasons (e.g, “more realistic model assumptions, the specification of a falsifiable model, and the ability to evaluate model fit”) (Fabrigar & Wegener, 2011).

Factor Extraction. A parallel analysis was used to determine the number of factors in our measure in favor of more subjective approaches (e.g., Kaiser criterion, scree plot) (Wood, et al., 2015). The hypothesized factors for the measure were assumed to be related to each other, thus an oblique rotation will be used (Fabrigar & Wegener, 2011). Correlations between the different items were examined as well for both a validity check and to examine unusual factor loadings. Factor inter-correlations were be examined; if factor inter-correlations were greater than .80 (i.e., poor discriminant validity), the researcher considered a more parsimonious solution. As an EFA is largely exploratory or descriptive process, thus, the “meaningfulness and interpretability of the factors” was considered in addition to the more mechanical approach (Fabrigar & Wegener, 2011). Factors with less than three items were scrutinized. Items were evaluated with regards to cross-loadings (i.e., items loading high (> .3) on more than one factor) and low communalities (e.g., items with small loadings (<.4)) (Brown, 2015). Lastly, the EFA was performed again in the event of modifying the number of factors or items.

Confirmatory Factor Analysis (CFA). Separately, on the remaining forty percent of the data a CFA was used to test the factor structure of the Perceived Error Scale. Similar to the EFA, the scale was evaluated based on model fit. Model fit was measured by a chi-square statistic, Root Mean Square Error Approximation (RMSEA), comparative fit indices (CFI), and the Tucker-Lewis index (TFI) and individual item loadings. See Table 6 for recommended cut-off values (Kline, 2015).

Table 6: *Fit Measures and Cut-off Values*

Measure	Name	Cut-Off Value
χ^2	Chi-Square	$p < .05$
RMSEA	Room Mean Square Error Approximation	$< .08$
NFI	Normed Fit Index	≥ 95
CFI	Comparative Fit Indices	$\geq .90$
TFL	Tucker-Lewis Index	$\geq .95$

Additionally, alternative models were tested (e.g., a one-factor solution) and compared to the hypothesized models. Appropriate changes were made accordingly. For example, poorly loaded items were removed if appropriate. Validity was also addressed by testing the correlations with error severity, job experience and proficiency, and personality traits (e.g., agreeableness, conscientiousness, and locus of control). This was done with latent variable models rather than scale scores.

CHAPTER 3: STUDY TWO: APPLYING THE PERCEIVE ERROR SCALE TO MEASURE RUMINATION, BURNOUT, AND COUNTERPRODUCTIVE WORK BEHAVIORS

An error may have meaningful consequences that impact the employee, company, and consumer. Workplace error incidents with lasting consequences will most likely emotionally impact the culpable individual involved. Error management training is one tool organizations use to teach their employees to learn from their errors (Keith & Frese, 2008). Often, research studies examining error management training focus on the cognitive aspects (e.g., learning, meta-cognition) and ignore the emotional costs of errors (e.g., burnout) or downstream implications for employee behavior (e.g., CWBs).

The current study extends previous error research by addressing the emotional consequences of error and exploring mediating variables (i.e., rumination, burnout) that lead to poorer psychological adjustment (burnout) and CWBs). Whereas identifying environmental factors (i.e., types of error) represented study one, applying the measure to describe person-level characteristics (i.e., burnout, ruminative thinking, counterproductive work behaviors) will constitute study two. Together, study one and study two provide evidence that perceptions of error can be measured and applied in research to learn more about individual differences. Further, it provides extensions of goal-progress theory and stressor-emotion model of CWB, clarity around mediating variables, and inform training and counseling regarding error (e.g., error management training), and illuminate important unseen consequences of error to the organization (i.e., CWBs). Study two was designed to apply the perceived error scale in a research setting to address whether ruminative thinking patterns and burnout sequentially mediate the relationship between error and counterproductive work behaviors. Together, this will provide insight into the

psychological adjustment following error and potential conditions under which psychological adjustment may be mitigated or exacerbated.

Control Theory and Goal Progress Theory.

One possible health outcome of error is poorer psychological adjustment (i.e., rumination and burnout). Additionally, it is possible that error may have downstream implications from burnout and rumination to counterproductive work behaviors.

Poorer psychological adjustment is expected when considering error in the context of both control theory (Carver & Scheier, 1998) and goal progress theory (Martin & Tesser, 1996). Control theory, also known as cybernetics, is a theory, which uses a feedback process to explain how a person responds to achieved goals or goal failures (Carver & Scheier, 1998). Control theory assumes that people are self-regulating beings and in the absence of achieving an ideal, humans will try to modify themselves or the situations to decrease the discrepancy between reality and the ideal.

Control theory proposes that people follow a particular model when responding to goals. This model consists of a negative feedback loop with four elements: (1) an input function, (2) a reference value, (3) a comparator and (4) an output function. An input function essentially acts as a sensor for the system (Carver & Scheier. 1982). Within the study of humans, this would be analogues to perception (Carver & Scheier, 1998). The next pair of elements (the reference value and the comparator) act together. The reference value is the 'ideal' that the human wishes to achieve (Carver & Scheier, 1998). For the purposes of this research, the reference value is synonymous with the term goal (Carver & Scheier, 1998). A reference value is essential to the function of the comparator. As the name suggests, the comparator compares values.

Specifically, it compares the ideal (i.e., reference value, goal) to the reality (i.e., truth or perceived truth).

The act of comparing leads to either one of two outcomes: 1) the reference value and reality are equal or 2) there is a discrepancy between the reference value and reality. Following this comparison, the last part of the control theory takes place: the output function. The output function is an "effector," which acts on the system's internal and/or external environment. In other words, the output function is an action that attempts to regulate the system to remove any discrepancies between the ideal and reality. This can take many forms including human behavior or changes in cognition. For example, following employee error, an employee may experience cognitive distress. This is due to a discrepancy between the reference value (i.e., expectations) and the outcome (i.e., the input function). Once this discrepancy is known, the system (i.e., human) tries to correct itself. Small discrepancies may result in minute changes in behavior or cognition. For example, in the case of error, the person may try to lower standards of the ideal to mitigate the discrepancy between the ideal and reality. However, large discrepancies may result in more drastic measures to balance the system: disengagement from the goal itself. Finally, in accordance with goal progress theory (Martin & Tesser, 1996), in the event that disengagement is not possible, rumination occurs.

Error and Rumination.

Rumination can have either positive or negative valences in addition to subjects (e.g., anger rumination, work rumination) (Besharat & Shahidi, 2010; Frone, 2014). Rumination is consequently a flexible variable, which lends itself well to error research. Work-related rumination is well suited to the current research focused on employee error. Work-related rumination consists of three components: (1) affective rumination, (2) problem solving

pondering, and (3) detachment (Cropley & Zijlstra, 2011). Affective rumination is most consistent with the common conceptualization of rumination. *Affective rumination* consists of negative, invasive repetitive cognitions. Meanwhile, *problem solving pondering* is more focused on evaluating the problem and generating a solution. It is not negative in nature, which separates it from rumination. Finally, *detachment* occurs when a person is able to "switch off" after leaving work. Intuitively, those who are low on detachment are more likely to be high on affective rumination. Rumination is only problematic if it results in negative consequences (i.e., poorer psychological adjustment) (Cropley & Zijlstra, 2011), accordingly, affective rumination is the focus of this research study.

Hypothesis 1a: Latent, planning, individual, and general culpability are positively related to affective rumination.

Sequential Meditation: Rumination and Burnout.

Rumination, or repetitive thinking patterns, interferes with the essential recovery process following work (Cropley & Zijlstra, 2011). It is important to note, that a person will continue to ruminate until either the goal is met, or they disengage from their goal (Martin & Tesser, 1996). More generally, rumination is considered a precursor to a variety of negative psychological outcomes including burnout (Lyubomirsky, et al., 2015). While much of the literature is clinically focused, recent organizational literature has extended the theory to explain poorer psychological outcomes in the workplace (Baranik, et al., 2017; Wang, et al., 2013). Regardless of industry, errors inherently involve a failure to achieve a predetermined goal (see Chapter 2). This failure to achieve a goal may result in rumination, which may lead to poorer psychological adjustment. Accordingly, goal progress theory is well suited for predicting burnout through rumination following error.

Hypothesis 2: Rumination is positively related to burnout.

Perceptions of error and CWB.

The Stressor-Emotion model of counterproductive work behavior was used to frame the hypothesis that burnout and rumination may lead to increased CWBs. (Spector & Fox, 2006). The Stressor-Emotion model of CWB builds of Dollard et al.'s (1939) frustration aggression hypothesis suggesting that interference when progress towards a goal is interfered with and that person attributes that interference with something outside of their control, then aggression will occur (Fox & Spector). Furthermore, it often occurs in response to action taking by another individual (or organization) that may be perceived as unjust. Key to this is that the person who conducts the aggression must attribute the interference of the goal to another individual

Consequently, we propose that individuals who are more likely to perceive an error to be a latent error (i.e., a systematic error) are more likely to conduct counter productive work behaviors in retaliation in order to gain control of the situation and right the perceived wrong done through the latent error Alternatively, systematic or latent errors will lead to rumination, and thus increased CWBs (Spector & Fox, 2005, pg 74). Furthermore, those which are deliberate actions are seen as more egregious than those which are accidental – consequently, the researcher proposes that planning errors will be unrelated to counterproductive work behaviors, as those errors were a failure of the plan itself – but not the failure of a person, and thus perhaps perceived as unintentional (Pastore, 1952).

Hypothesis 3: Different perceptions of error will result in differing levels of CWBs.

3a: Latent and individual error, as well as general culpability will lead to increased CWBs

3b: Planning error will not be related to CWBs

Burnout and CWB.

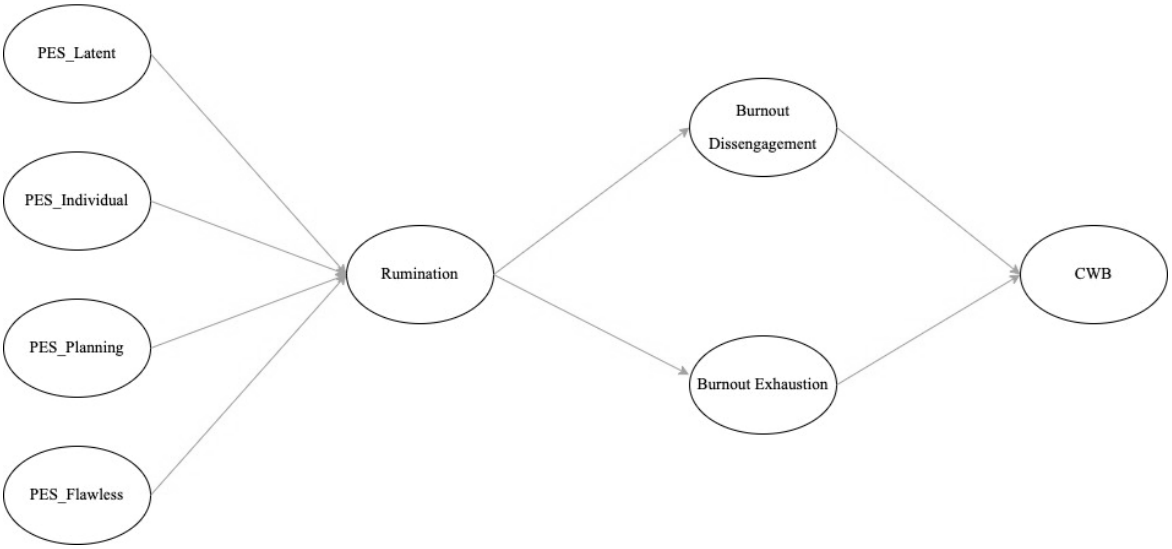
There is supporting literature suggesting that different aspects of burnout predict different aspects of CWB. For example, a 2019 study on high school teachers provides initial evidence that reduced personal accomplishment and depersonalization in particular, are related to CWBS like withdrawal, and sabotage. Additionally, in the same study emotional exhaustion and depersonalization predicted abuse (Makhdoom, et al., 2019).

Hypothesis 4: Burnout is positively related to CWBs.

Hypothesis 5: Individual and latent errors will lead to rumination, thus increasing burnout, and consequently CWBs.

Figure 2: *Proposed Conceptual Model*

Conceptual Serial Mediation Model Predicting CWBs from the PES via Rumination and Burnout
Note for simplicity that the direct effect from PES and Rumination to CWB are excluded, as well as the direct effect from PES to Burnout



Study Two: Methods.

Procedure. This study utilized a cross-sectional design to test the proposed sequential mediation model. Like study one, the sample will consist of participants recruited online via MTurk. Most workers in Human Intelligence Tasks (HITs) are located in the United States. This was an efficient and inexpensive approach to collecting the data should result in a substantial and diverse sample (Paolacci,et al., 2010), compared to traditional online recruitment methods and sample pools (i.e., undergraduate students) that psychological research usually relies on.

Participants. Mturk worker characteristics and exclusion criteria were the same as study one.

***The Perceived Error Scale*.** Initial items were developed based on a thorough review of the literature. These items map onto four factors: planning errors, action errors, latent errors, and general culpability. See Table 1 (Appendix A) for a list of initial items.

Rumination. Rumination was measure with two scales. The first rumination scale was error specific and included items adapted from McCullough, Bono, and Root's (2007) 5-item measure of rumination on a 6-point rating scale: 0 (not at all true of me) to 5 (extremely true of me). Example item includes, "Even when I engage in other tasks, I think about the error I made." The second measure of rumination was the response style questionnaire on a four-point scale consisting of items like "think 'I won't be able to concentrate if I keep feeling this way.' (Nolen-Hoeksema,1991)

Counterproductive Work Behaviors. CWBs were measured using the 32- item Counterproductive Work Behavior Checklist (CWB-C) (32-item) developed by Fox and Spector (2001). The measure utilizes a 5-point scale: Never, once or twice, once or twice per month, once

or twice per week, and every day. The measure can be broken down into five subscales: abuse, production deviance, sabotage, theft, and withdrawal.

Burnout. Burnout was measured with the Oldenburg Burnout Inventory (OLBI) consisting of 16 items. Example items include, "I always find new and interesting aspects in my work," and "There are days when I feel tired before I arrive at work." This measure was originally developed as an alternative to the Maslach Burnout Inventory (Demerouti, et al., 2003). This measure has been updated and tested to use in English speaking populations (Halbesleben & Demerouti, 2005).

Demographics. In addition to work experience and proficiency, demographic measures such as age, gender, and educational attainment were included.

Data Analysis Plan. A confirmatory factor analysis was conducted to confirm whether the factor structure from study one remained stable and consistent with the factor structure in study two. This was essential step before building the structural model. Finally, after testing model fit, the serial mediation model was investigated using R and lavaan (Rosseel, 2012). The significance of indirect effects was determined by examining the 95% confidence intervals from a bootstrapping procedure. Confidence intervals of indirect effects which do not include zero were considered to be significant.

CHAPTER 4: RESULTS

Study 1: Perceived Error Scale Factor Structure

The sample was randomly split such that sixty percent of the data were used for an exploratory factor analysis (EFA) and forty percent of the data were used for a confirmatory factor analysis (CFA). The two samples were determined to have similar demographic characteristics (see Table 7 for continuous variables and Tables 8 and 9 for categorical variables).

Table 7: *EFA & CFA Demographics*

	EFA Sample		CFA Sample				
	M	SD	M	SD	t-test	Cohen's d	95% C.I.
Age	39.45	9.53	40.96	8.19	$t(79.82) = -0.370$ $p = 0.715$	0.07 (-.03, 0.45)	[-4.68, 3.22]
Years of Work Experience	11.35	8.71	11.42	10.77	$t(367.67) = -0.08$ $p = 0.930$	0.01 (-.18, 0.20)	[-0.357, 2.860]

Table 8: *Self-Described Gender by Split Sample*

	EFA Dataset		CFA Dataset	
	N	%	N	%
Woman	134	49%	74	44%
Man	138	51%	93	56%
Prefer not to disclose	1	0%	0	0%
Prefer to self-describe	0	0%	0	0%

Table 9: *Degree Attainment by Split Sample*

	EFA	CFA
Grades 1 through 11	0.00%	0.23%
12th grade - no diploma	0.23%	0.00%
Regular high school diploma	4.32%	1.14%
GED or alternative credential	0.91%	0.00%
Some college credit but less than 1 year of college	3.41%	1.59%
One plus year of college credit, no degree	5.45%	1.59%
Associate's degree	7.05%	4.09%
Bachelor's degree	27.05%	19.32%
Master's degree	11.14%	7.27%
Professional degree	0.91%	1.59%
Doctorate degree	1.59%	1.14%

Exploratory Factor Analysis.

An EFA was conducted with 273 observations (i.e., sixty percent) of the data collected in study 1 to determine the number of factors in the Perceived Error Scale. The data were examined to determine whether the items were normally distributed and whether there was appropriate sampling adequacy before moving forward with the analysis.

Several methods for identifying the number of factors were reviewed (see Table 10). Parallel analysis suggests that the number of factors was seven and the number of components was seven. Although the parallel analysis suggested more factors, the researcher used theory to justify exploring a three-factor, four-factor, and five-factor solution were explored. Ultimately a four-factor solution was selected as the best fit conceptually. Three items were dropped from the scale due to low loadings (<.40). Thirteen items were dropped due to cross loadings. Lastly, one item was dropped because it was too similarly worded ("I made an error due to being on autopilot" vs. I made an error because I was on autopilot"). The resulting scale consisted of 32 items (see Table 11 for retained items).

Conceptually, the following factors emerged and were determined to have reasonable reliability (i.e., Ω > .70): (a) latent error (Ω = .88), (b) individual level action (Ω = .73), (c) cognitive/planning error (Ω = .87), and (d) general culpability (Ω = .85). Of note – many of the negatively worded items loaded together making up the last factor, flawlessness. Latent error was significantly correlated ($p < .05$) with all other PES subscales and work locus of control. Specifically, latent error was negatively correlated with individual error ($r = -.361$, $p = .001$) such that those who scored higher on perceiving the error was due to system level factors were less likely to believe the error was due to something at the individual level on their part. Latent error was also significantly correlated with planning ($r = .424$, $p < .001$) and general culpability ($r = .631$, $p < .001$). See Table 12 for the remaining correlations.

Table 10: *Number of Factors*

Method	No. of Factors
VSS complexity 1 achieves	1
VSS complexity 2 achieves	3
The Velicer MAP	5
Empirical BIC	6
Parallel Analysis	7

Figure 1: *Parallel Analysis Scree Plots*

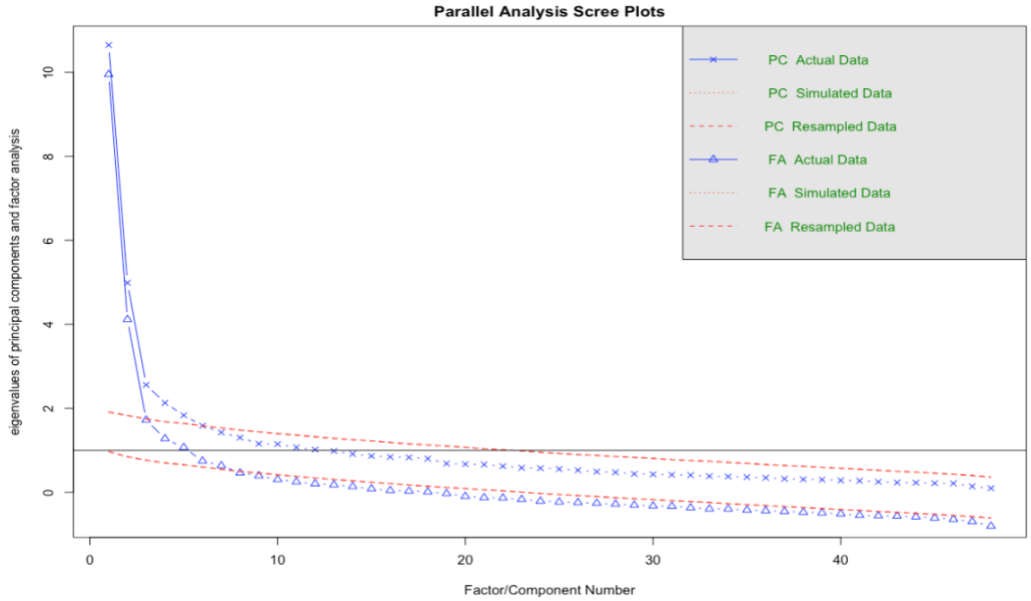


Table 11: *Four Factor EFA Loadings for Retained Items*

Latent variable	Item Text	Latent error	Planning error	General culpability	Individual action	Uniqueness
1. Latent error						
PES_39	External and internal factors lined up and so the error took place	**0.709**	0.038	0.027	0.009	0.496
PES_12	Lack of resources caused me to make a mistake	**0.585**	0.081	-0.137	-0.046	0.518
PES_45-	I am the only person responsible for this event	**0.574**	-0.127	0.019	-0.233	0.613
PES_17	There was a misunderstanding between colleagues which resulted in an error	**0.498**	0.091	-0.099	-0.036	0.652
PES_41	With additional policies/guidance this error would not have taken place	**0.454**	0.224	-0.079	-0.112	0.605
PES_40	There were policies in place that lead to this error	**0.451**	0.095	-0.413	0.222	0.457
PES_16	I did not communicate well enough which resulted in an error	**0.444**	0.214	0.011	-0.009	0.697
PES_46	I am not responsible for this error	**0.442**	-0.124	-0.101	-0.231	0.678
PES_23	I did not have the information required to make the right decision	**0.436**	0.199	-0.145	-0.371	0.423
PES_35	I did not perform an action because I thought someone else would	**0.416**	0.104	-0.260	0.114	0.641
PES_44	This event involved several levels of management	**0.373**	0.174	-0.058	-0.07	0.749

Latent Variable	Item Text	Latent error	Planning error	General culpability	Individual action	Uniqueness
2. Planning error						
PES_1	My decision resulted in mistake(s)	-0.241	**0.525**	0.035	0.037	0.74
PES_4	My planning was a reason for an error	0.057	**0.527**	0.018	0.086	0.688
PES_19	I misclassified the situation	0.032	**0.538**	-0.044	0.063	0.681
PES_14	I interpreted the situation incorrectly and made a mistake	0.158	**0.613**	0.132	-0.112	0.559
PES_5	My judgment caused an error	-0.069	**0.655**	0.174	-0.032	0.594
3. General culpability						
PES_8-	The decision(s) I made was correct	-0.025	0.158	**0.761**	-0.034	0.43
PES_33-	All my actions were correct	0.024	0.077	**0.711**	0.132	0.442
PES_30-	I executed the plan flawlessly	-0.091	-0.119	**0.697**	0.019	0.402
PES_15-	I made the right decision	-0.061	0.263	**0.682**	0.073	0.449
PES_27-	I did what I planned to do	0.185	-0.209	**0.621**	0.278	0.468
4. Individual action						
PES_28	I made an error because I was on autopilot	0.033	-0.068	-0.053	**0.769**	0.442
PES_31	I performed the action too quickly	-0.117	-0.024	-0.069	**0.646**	0.574
PES_29	I skipped a step which resulted in a mistake	0.217	0.082	-0.049	**0.570**	0.645
PES_25	My actions were not consistent with my intention	0.191	-0.132	0.238	**0.568**	0.579
PES_9	My lack of attention resulted in a bad decision	-0.180	0.283	0.190	**0.556**	0.443
PES_11	I was rushed and I made a mistake	0.070	-0.091	0.146	**0.534**	0.663
PES_24	An error occurred because I did not do what I intended to	0.025	0.022	0.143	**0.476**	0.716
PES_36	I forgot to do one or more steps in a plan	0.277	0.152	0.129	**0.463**	0.669
PES_26	I meant to do something else	0.118	-0.145	0.205	**0.432**	0.734
PES_38	Normally, this error would not have happened	-0.044	-0.109	0.117	**0.364**	0.806

Confirmatory Factor Analysis

lavaan was used to conduct a CFA on the remaining data from study 1 (n = 167) using only the items retained in the EFA. The fit indices indicate moderate fit: $\chi 2$ = 736.559, (df = 426), robust CFI = .807, robust TLI = .789, robust RMSEA = .068 95% CI [.60-.076], SRMR = .096. The null model's RMSEA (0.150) is less than 0.158, thus the RMSEA was used for model evaluation, thus even though the CFI and TLI fit indices did not meet the .90 and .95 cutoffs (respectively) the researcher concluded that there was sufficient fit as the RMSEA is less than .08 (Kenny, Kanishan, McCoach, 2015). This is unsurprising given the smaller correlation observed between action error and planning error (r = -.004) and planning error and general culpability (r = .010) (see Table 12 for all correlations between latent factors in study 1).

Finally, note that two sets of residual covariances were added based on modification indices. PES_29 ("I skipped a step which resulted in a mistake") and PES_36 ("I forgot to do one or more steps in a plan") were allowed to covary, as well as PES_31 ("I performed the action too quickly") and PES_11 ("I was rushed and I made a mistake").

Validity

The relationship between the PES and other scales established in the literature were examined to determine convergent and divergent validity. As expected, the latent error subscale had a moderately positive relationship with external locus of control (r = .328). Additionally, there is a small negative correlation between individual error and external locus of control (r = -.125). Of note, there was a small positive correlation between social desirability and work locus of control (r = -.367), but this correlation was not seen in latent error and social desirability (-.052) nor in the reverse direction for action error and social desirability (.077) despite their

relationship with work locus of control. See Table 12 for all correlations among latent variables in study 1.

Table 12: *Correlations among latent variables in study 1*

	Latent error	Individual error	Planning error	General culpability	Work LoC	NEO FFI	Social desirability
Latent error	1						
Individual error	-0.361*	1					
Planning	0.424*	-0.004	1				
General culpability	-0.631*	0.530*	0.010	1			
Work Loc	0.328*	-0.125	-0.073	-0.085	1		
NEO	0.175	-0.205*	-0.040	-0.254*	.207*		
Social desirability	-0.052	0.077	0.067	-0.027	-0.367*	-.550*	1

Note: asterisk indicates significance at the p = .05 level. Note: LoC = Locus of Control

Study 2: Results

Four hundred and eighty participants completed the survey. Just over half of the participants identified as male (52.89%). Most participants were college educated or higher (66.89%) (see Table 13 for frequency of all degrees). Participants were on average 39 years of age and had on average ten years of professional experience. Participants came from a wide range of industries like business, finance, banking, information technology, healthcare, biotech, animal, education, and sales accounting for over half of the industries (see Table 14 for all industries).

Table 13: *Degree Obtainment*

Degree	%
No schooling completed	0.00%
Nursery school	0.00%
Grades 1 through 11	0.00%
12th grade - no diploma	0.67%
Regular high school diploma	8.00%
GED or alternative credential	1.33%
Some college credit but less than 1 year of college	5.11%
1 or more years of college credit, no degree	9.78%
Associate’s degree	8.22%
Bachelor's degree	44.22%
Master's degree (for example: MA, MS, MEng, MEd, MSW, MBA)	17.78%
Professional degree beyond bachelor's degree (for example: MD, DDS, DVM, LLB, JD)	2.00%
Doctorate degree (for example, PhD, EdD)	2.89%

Table 14. *Industry Representation in Sample*

Industry	%
Business, Finance and Banking	12.50%
Information Technology	12.29%
Healthcare, Biotech and Animal	11.46%
Education	10.21%
Sales	9.79%
NA	6.25%
Logistics	5.00%
Engineer, Aerospace	3.96%
Manufacturing	3.96%
Hospitality, Food Industry	3.96%
Government	3.33%
Law	3.33%
Marketing, Design, Print Media	2.71%
Data	2.29%
Mental Health Services	1.88%
Call Center and Customer Service	1.67%
Human Resources, Management or Leadership	1.46%
Arts and Entertainment	1.04%
Non-profit	1.04%
Construction	1.04%
Consulting and Independent Contractor	0.83%

Prior to setting up the model, the quality of the data were reviewed. The researcher examined the following: (1) missingness of data, (2) normal distribution of endogenous variables, (3) linearity, (4) independence, and (5) outliers. Additionally, the quality of responses were reviewed prior to conducting the CFA and SEM in order to remove "speeders" (i.e., those who completed the survey in less than half of the median survey completion time) and flatliners (i.e., those who answered every question in the scale the exact same way).

The researcher started with 480 observations and ultimately 166 observations were removed due to data quality resulting in a final sample size of 314. Sixty-one observations were removed because the respondent indicated they did not commit an error within the past 2 weeks.

Twenty-six individuals were removed due to speeding. Fourteen individuals flatlined on the response style questionnaire. Two individuals flatlined on the burnout questionnaire. Finally of the remaining participants, thirty-three individuals flatlined on the counterproductive work behaviors questionnaire.

Lastly, one rumination measure was dropped due to an unacceptably large portion of flatliners (n = 167). Two measures of rumination were used in this study: a measure of rumination specific to error (McCullough, et al., 2007) and a general measure of rumination (Nolen-Hoeksema,1991). During the data cleaning phase of the analysis, it became evident that the error specific rumination measure was not generating sufficient variance in the responses. Specifically, over half of the sample flatlined (i.e., responded with the same answer to every question within the measure). The researcher decided to remove this measure from the analysis accordingly.

The remaining clean dataset was also examined for missingness and normality. Ultimately, it was determined that none of the individual-level variables were normally distributed. This is unsurprising given the ordinal nature of the data (i.e., survey data) and low frequency of occurrence for many of the items (i.e., counterproductive work behaviors).Twenty of the 48 items for PES were skewed (in either direction) (Table 23 in the appendix for all descriptive statistics for study 2); consequently, a robust maximum likelihood (MLR) estimator was used in the face of the non-normality of the data because this estimator is robust to violations of the normality assumption (Finney & DiStefano, 2008).

Confirmatory Factor Analysis.

A series of CFAs were set up on the full measurement model to answer three main questions: (1) Does the PES factor structure replicate from Study 1? (2) Given a high correlation

between burnout subscales, will a single factor better fit the data? (3) Given the high correlation between counterproductive work behavior subscales, will a single-factor solution best fit the data? Results of the CFA informed the structural model ultimately used to test the relationship between perceived error, rumination, burnout, and counterproductive work behaviors.

CFA 1: PES Stability from Study 1 to Study 2.

lavaan was again used to conduct a CFA on the PES items from study 2 in order to determine of the factor structure replicated that which we saw in Study 1. Similar to study 1, the robust CFI (.785) and TLI (.765) fit indices did not meet the .90 and .95 cutoffs (respectively). However, the robust RMSEA (.069) is below .80. Additionally, the RMSEA is below .158 thus the null RMSEA was also evaluated (.145). The same residual covariances from study 1 were also included in this CFA: PES_29 and PES_36 as well as PES 31 and PES_11. Given the similar results, the researcher moved forward with the factor structure identified in study 1.

CFA 2: OLBI Factor Structure.

As previously stated, the high correlation between the two sub factors within the OLBI (disengagement and exhaustion, $r = .824$, $p < .001$) led the researcher to examine two solutions: the originally proposed two-factor model and a one-factor model. The more parsimonious model with less parameters (i.e., the one-factor model) fit the data better with smaller AIC and BIC values. Neither model produced acceptable fit based on recommended cutoffs for CFI, RMSEA, and SRMR (as indicated in Table 15 and Table 16) though this may be less relevant given the small degrees of freedom. Consequently, the researcher moved forward with a one factor solution for the burnout measurement.

Table 15: *Model Comparison for Burnout CFAs*

	df	AIC	BIC	χ^2	$\Delta\chi^2$	df	*p*
One-factor	89	15,239	15,362	811.16			
Two-factor	90	15,361	15,479	934.96	46.251	1	< .001

Table 16: *Fit indices for OLBI factor structures*

OLBI Models	Robust χ^2	df	*p*	Robust CFI	Robust RMSEA	SRMR
One-factor	672.96	90	<.001	0.718	0.159	0.105
Two-factor	575.24	89	<.001	0.767	0.145	0.104

CFA 3: CWB Factor Structure.

Similar to the OLBI, high correlations were observed between the factors within the CWB measure: abuse, production deviance, sabotage, theft, and withdrawal (Table 20). All factors had correlations greater than .93 except for theft and withdrawal. Unfortunately, correlations were high enough that the original measurement model conduct prior to the structural model resulted in a non-positive definite matrix - warranting the need to collapse factors. A nested model was used to compare one and the original five-factor model as originally designed. Both CFAs and they were found to be significantly different from each other (see Table 17). This is also evident in the smaller AIC and BIC values for the one factor model compared to the five-factor model. Because the CWB item-level data did not meet the normality assumption, robust measures of fit indices were used. Measures of fit for both CFAs for the CWB can be found in Table 18. Similar to the OLBI, the one-factor structure best fit the data and was used in subsequent analyses.

Table 17: *Model fit Comparisons CWB CFAs*

	df	AIC	BIC	χ^2	$\Delta\chi^2$	df	*p*
One-factor	3,674	67,000	67,938	8342.3			
Five-factor	3,712	67,298	68,089	8716.5	194.44	38	< .001

Table 18: *Fit indices for CWB factor structures*

CWB Models	Robust χ^2	df	*p*	Robust CFI	Robust RMSEA	SRMR
One-factor	7,868	3,712	<.001	0.797	0.059	0.082
Five-factor	7,588	3,674	<.001	0.810	0.057	0.082

Before running the structural equation model, the researcher conducted a CFA to confirm the full measurement model taking into account the decisions to collapse burnout and counterproductive work behavior. This step is an essential part of setting up the structural equation model (Brown, 2015). This is particularly important for the PES and subscales given that this measure has only been used once before (i.e., Study 1). Furthermore, measurement issues were discovered in both the counterproductive work behaviors scale as well as the burnout scale warranting further investigation (i.e., subscales were highly correlated with each other).

The final CFA included all measures for the sequential mediation model and demonstrated acceptable fit according to the robust RMSEA: χ^2 = 8,471, df = 4,530, $p < .001$, Robust CFI = .794, Robust RMSEA = .055 (95% CI .053, .056), SRMR= 0.78). Note that in the process of setting up the model, several items were allowed to covary (see Table 19).

Table 19: *Residual Covariances in CFA*

Residual Covariances	Item 1 Text	Item 2 Text
PES_29~~ PES_36	I skipped a step which resulted in a mistake	I forgot to do one or more steps in a plan
PES_31~~ PES_11	I performed the action too quickly	I was rushed and I made a mistake
RespStyleQ_11 ~~ RespStyleQ_21	Go away by yourself and think about why you feel this way	Go someplace alone to think about your feelings
RespStyleQ_2 ~~ RespStyleQ_14	Think "I won't be able to do my job if I don't snap out of this"	Think "I won't be able to concentrate if I keep feeling this way."
Burnout_1 ~~ Burnout_7		
Burnout_15 ~~ Burnout_16	I feel more and more engaged in my work	When I work, I usually feel energized
CWB_25 ~~ CWB_22	Threatened someone at work with violence	Stole something belonging to someone at work
CWB_14 ~~ CWB_32	Insulted someone about their job performance	Insulted or made fun of someone at work

Table 20: *Correlations among proposed latent variables in Study 2*

Variable	PES_L	PES_I	PES_G	PES_P	Rumn	Brnt_E	Brnt_D	CWB_Ab	CWB_PD	CWB_Sb	CWB_Th	CWB_Wt
PES_Latent	1											
PES_Individual	-0.265	1										
PES_General	-0.597	0.31	1									
PES_Planning	0.33	0.004	0.064	1								
Rumination	0.318	0.206	-0.064	0.179	1							
Burnout_Exhaustion	0.236	0.252	0.053	0.123	0.367	1						
Burnout_Dissengagement	0.131	0.308	0.062	0.017	0.215	**0.82**	1					
CWB_Abuse	0.484	0.055	-0.422	0.113	0.251	0.145	0.171	1				
CWB_ProdDev	0.493	0.094	-0.443	0.138	0.271	0.204	0.239	**0.939**	1			
CWB_Sabotage	0.474	0.051	-0.476	0.109	0.259	0.105	0.142	**0.98**	**0.965**	1		
CWB_Theft	0.457	0.062	-0.469	0.064	0.234	0.15	0.176	**0.954**	**0.98**	**0.982**	1	
CWB_Withdrawal	0.259	0.095	-0.264	-0.023	0.221	0.206	0.29	0.553	0.692	0.558	0.679	1

Note: High correlations (>.80) warranting further investigation are **bolded** and highlighted in grey. Correlations were extracted from the *lavaan* model using cov2cor function.

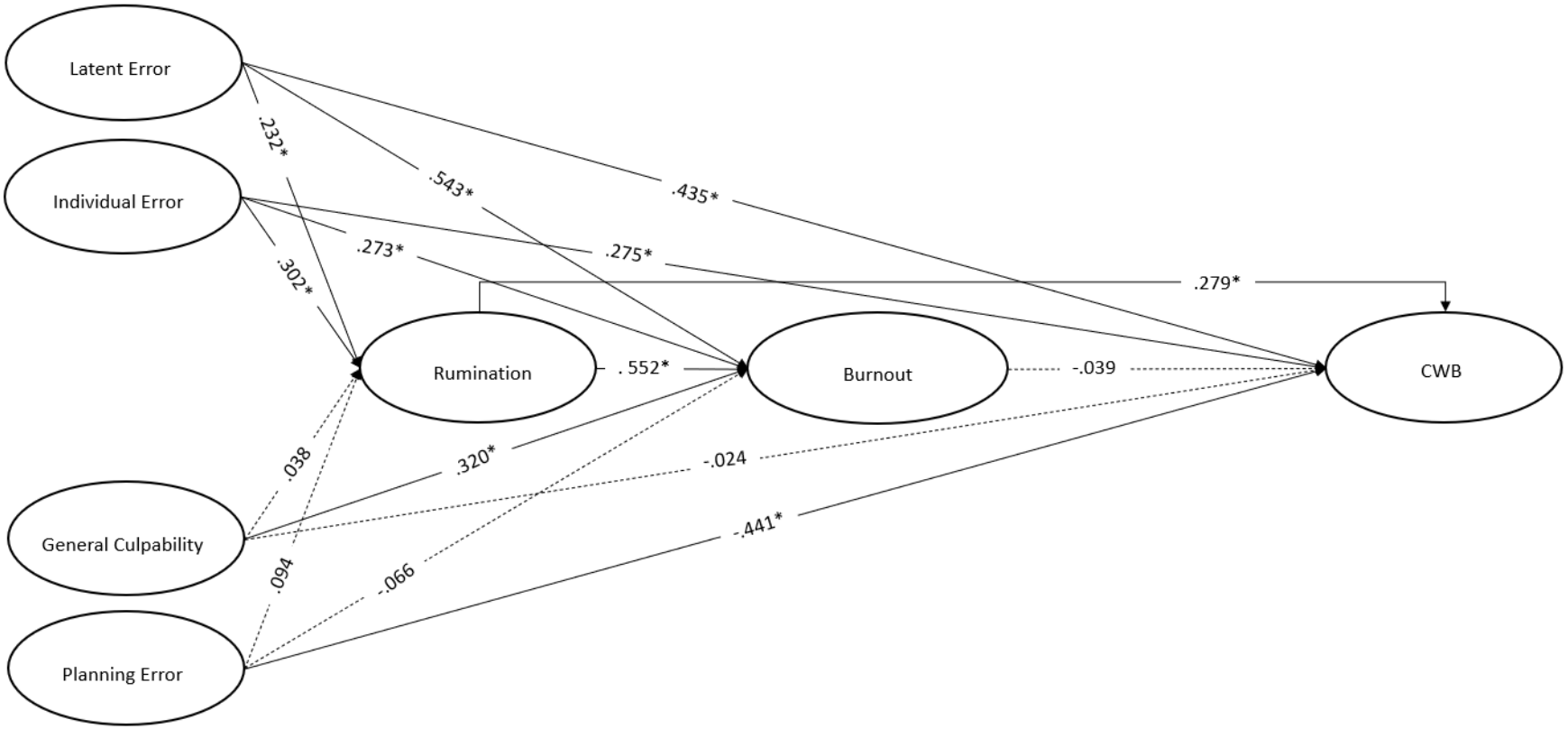
Abbreviations :PES = Perceived Error Scale; L = katent; I = individual; G = general culpability; P = planning; Rumn = rumination; Brnt_E = burnout-exhaustion; Brnt_D = burnout-disengagement; CWB = counterproductive work behaviors; Ab = abuse; pd = production deviance; sb = sabotage; Th = theft; Wt = withdrawal

SEM Serial Mediation Analysis.

A structural equation model was set up using *lavaan* in order to test the hypothesis that rumination and burnout sequentially mediate the relationship between perceived error and counterproductive work behavior. Fit indices indicate a moderate fit for the data: $\chi 2$ = 7,252, df = 3672, CFI = .828, RMESA = .054, 95% CI (.052,.054), SRMR = .076. As illustrated in Figure 2, the perception that the error was due to the individual and the perception that the error was due to system (i.e., latent error) is positively related to burnout, rumination, and counterproductive work behaviors. Interestingly, the propensity for the individual to believe they were not at fault was negatively related to counterproductive work behaviors and positively related to burnout. Of note, the perception that the error was due to poor planning was unrelated to any of the other downstream variables in the serial mediation model. All standardized regression coefficients are presented in Table 21.

Lastly, a simulation analysis was performed to test for indirect effects in the model. Although none of the full serial mediation paths are significant, four indirect paths' confidence intervals did not include zero: (1) Latent Error --> Rumination --> CWB, (2) Individual Error --> Rumination --> CWB, (3) Latent Error --> Rumination -->Burnout, and (4) Individual Error --> Rumination -->Burnout. Specifically, latent and individual error has positive effect on both counterproductive work behaviors and burnout through rumination. See Table 22 for all indirect effects in the model.

Figure 2: Final Serial Mediation Model



Note: Standardized regression coefficients are reported.

Table 21: *Regression Coefficients and Standard Errors in Full Model*

	Estimate	z-value	p	Standardized
Latent error → rumination	**0.232**	**1.961**	**0.050**	**0.219**
Individual error → rumination	**0.302**	**3.771**	**0.000**	**0.285**
Planning error → rumination	0.094	0.998	0.318	0.089
General culpability → rumination	0.038	0.347	0.728	0.036
Latent error → burnout	**0.543**	**3.934**	**0.000**	**0.415**
Individual error → burnout	**0.273**	**3.144**	**0.002**	**0.209**
Planning error → burnout	-0.066	-0.593	0.553	-0.05
General culpability → burnout	**0.320**	**2.526**	**0.012**	**0.244**
Rumination → burnout	**0.552**	**6.716**	**0.000**	**0.448**
Burnout → CWB	-0.039	-0.642	0.521	-0.039
Rumination → CWB	**0.276**	**3.771**	**0.000**	**0.225**
Latent error → CWB	**0.435**	**2.607**	**0.009**	**0.334**
Individual error → CWB	**0.275**	**3.269**	**0.001**	**0.211**
Planning error → CWB	**-0.441**	**-2.556**	**0.011**	**-0.339**
General culpability → CWB	0.024	0.295	0.768	0.000

Table 22: *Indirect Effects Using an MLR Estimator with MonteCarloCI*

	Lower CI	Upper CI
Full Serial Mediation Paths		
Latent error --> Rumination --> Burnout --> CWB	-0.012	0.005
Individual error --> Rumination --> Burnout --> CWB	-0.013	0.006
Planning error --> Rumination --> Burnout --> CWB	-0.014	0.005
General Culpability --> Rumination --> Burnout --> CWB	-0.004	0.003
Indirect Paths		
Latent Error --> Rumination --> CWB	**0.005**	**0.079**
Individual Error --> Rumination --> CWB	**0.011**	**0.067**
Planning Error --> Rumination --> CWB	-0.032	0.071
Flawless --> Rumination --> CWB	-0.019	0.030
Latent Error --> Rumination -->Burnout	**0.027**	**0.112**
Individual Error --> Rumination -->Burnout	**0.033**	**0.163**
Planning Error --> Rumination -->Burnout	-0.050	0.196
Flawless --> Rumination -->Burnout	-0.051	0.052
Rumination --> Burnout	-0.060	0.025
Latent Error --> Burnout --> CWB	-0.039	0.027
Individual Error --> Burnout --> CWB	-0.019	0.010
Planning Error --> Burnout --> CWB	-0.009	0.010
Flawless --> Burnout --> CWB	-0.020	0.017

Note: Indirect effects were acquired with monteCarloCI(), nrep = 1 million. Bolded lines do not include zero and are thus interpreted as significant.

CHAPTER 5: DISCUSSION

This study contributes to the literature by providing a tool to measure an individual's perception of error and demonstrating the relationship between these factors and key organizational outcomes like rumination, burnout, and counterproductive work behaviors.

Measuring perceptions of human error

The first study successfully demonstrated that the layperson perception of human error is consistent with the theoretical model of human error (Reason, 1990). Furthermore, this perception can be quantified using self-report surveys. In order to quantify an individual perception of error, a valid and reliable survey instrument needed to be developed. Based on a literature review, an instrument with three factors was proposed highlighting three types of errors: action errors, planning errors, and latent errors.

Action errors are those that occur at the individual level. Indeed, there was a small negative correlation between action errors and external locals of control, suggesting that individuals may be more likely to take ownership of the error (i.e., I made an error because I was on autopilot). This level of ownership over their environment may lead them to feel more responsible for the error that took place. Latent errors are those that occur at the organizational level (i.e., there were policies in place that led to this error). Interestingly, this factor was not correlated to work locus in control, suggesting that this is tapping into something above and beyond locus of control. Finally, planning errors also emerged from the study as a factor and included items like "I interpreted the situation incorrectly and made a mistake."

These three factors emerged from the exploratory factor analysis in addition to a fourth factor labeled "general culpability," in which reverse-worded items suggesting the individual was not at fault all loaded onto one factor. Of note, all of these items were negatively worded.

This is unsurprising, given that reverse-worded items are often correlated with each other (Zhang, et al., 2016). Ultimately, a four-factor solution was settled on before progressing to study 2. The four factors include the perception that the error was due to the individual, the system (i.e., latent), planning, and general culpability. It was notable to see how the theoretical categorization of errors is consistent with how the general public also perceives errors.

Key organizational and health outcomes of error.

The second study replicated the findings from the first study suggesting an individual's perception of error can consistently be reduced to the four factors: individual, latent, planning, and general culpability. Together, these studies provide researchers and practitioners a generalizable measure of an individual's perception of error.

Not only was the perception of error able to be quantified through survey methodology, but the relationship between the different perceptions of error and potential downstream implications of psychological and organizational health. Specifically, latent error and individual error both appear to have a relationship with rumination, burnout, and counterproductive work behaviors.

Consistent with goal progress theory, a relationship between burnout and rumination emerged even though burnout was necessarily collapsed into one factor. An individual had a goal to perform a work task without error, an error happened, and thus the goal was not obtained. Because this goal was not obtained due to factors outside of their control, they ruminate, and that rumination leads to burnout. Both rumination and counterproductive work behaviors theoretically arise again due to goal interference. Indeed, consistent with both the goal progress theory and the stressor-emotional model of CWB, we found that perceptions of latent error and individual error both lead to rumination which leads to increased levels of CWB. Interestingly,

planning errors was not related to any of the outcome variables. It was unsurprising to see that the factor, "general culpability" did not lead to adverse psychological events as individuals with higher scores on this factor likely do not attribute the error to anything they did.

Of note – perceived latent errors also led to counterproductive work behaviors. It is possible that the individual sees the organization at fault for leaving a system in place where the error was allowed to slip through and thus the person acts out in order to right the injustice they may perceive (Spector & Fox, 2006). This is only hypothetical though and additional research is warranted to investigate the potential explanatory pathway between latent error and counterproductive work behaviors.

Implications for practice

After adverse events, particular those with latent errors, organizations should seek ways to explain the error and demonstrate what they will do to prevent it from happening again. This may minimize the impact that those organizational level errors will results in revenge or retaliation on the employees' part; presumably to make up for the perceived injustice. Specifically, the employee may feel that those latent organizational factors set them up to fail (Spector & Fox, 2006).

Limitations and Future Research

Both studies had limitations. Namely, the second study was cross-sectional in nature, lending itself more to validity than a predictive of any outcome. Future researchers could employ a longitudinal design to further tease out what are outcomes of various perceptions of error. Additional limitations include the unknown impact that an online environment had on the survey takers. MTurk was utilize, thus relying on a convenience sample. Further – the "general culpability" factor could be a methodological artifact (Zhang, et al., 2016) as it consisted

primarily of reverse worded items. Additionally, it's possible that professional survey takers may be more immune to validity checks (e.g., "please answer strongly disagree"). Although the heterogeneity of job types allows for more generalizability, it's possible that more work-specific (e.g., healthcare) measures could be of more value to a practitioner in a given field. Finally, this study was conducted during COVID (February 2021 – June 2021).

There were a number of limitations in the data which hamstringed the analysis. Much of those limitations centered on the sufficient variance in the dataset. First, sufficient egregious errors are less frequent, thus potentially limited the variance available to the researcher. Similarly, the incidence rate of CWBs was low and may be why the researcher need to collapse the measure into one factor. It is possible with more sufficient variance, more nuanced differences could be teased out from the study. Further – the researcher also had to collapse burnout into a single factor. Neither CWB nor burnout are single facet contracts ultimately limiting the possible insights. There is reason to believe that different factors of burnout and CWB may be differently related. Indeed, Makhdoom, Atta, and Malik found a relationship emotional exhaustion and abuse but not with withdrawal or sabotage (2019). Future research should seek ways to collect more robust data to investigate these nuances.

Finally, there are no objective measures of error to compare the perception of error to reality. Despite these limitations, the current study provides initial support for the relationship between the perception of error, rumination, burnout, and counterproductive work behaviors.

Conclusion

This research aimed to quantify human perceptions of error and determine any downstream consequences of error on rumination, burnout, and counterproductive work behaviors. Based on a psychometric analysis, we determined that human perception of error is

consistent with how the literature categories error: action, planning, and latent error. We also provide cursory evidence that how an individual perceives the error may impact whether or not they engage in ruminative thinking patterns, burnout and counterproductive work behaviors. This is consistent with goal progress theory and provides supporting evidence of the stressor-emotion model of CWB. Future research may consider taking a more longitudinal approach to measuring prospections of error, burnout, rumination and CWB.

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APPENDIX A: SURVEY ITEMS

Study 1 Survey Items

Perceived Error Scale

Agreement Scale:

- Strongly disagree
- Disagree
- Neither agree nor disagree
- Agree
- Strongly agree

Factor 1: Planning Errors (e.g., Deciding on the wrong course of action)

1. My decision resulted in mistake(s)
2. I did not learn enough before making a plan
3. If I had a more objective view, I would have made a better plan
4. My planning was a reason for an error
5. My judgment caused an error
6. If I had had more time, I would have planned better
7. My lack of attention caused me to make an error
8. The decision(s) I made was/were correct (reverse score/item check)
9. My lack of attention resulted in a bad decision
10. I made an error due to being on autopilot
11. My lack of understanding caused me to make an error
12. I was rushed and I made a mistake
13. Lack of resources caused me to make a mistake
14. I made an error due to wrong arrangements
15. I interpreted the situation incorrectly and made a mistake
16. I made the right decision (reverse score/item check)
17. I did not communicate well enough which resulted in an error
18. There was a misunderstanding between colleagues which resulted in an error
19. I was not thinking about the long-term consequences
20. I misclassified the situation
21. I tried what worked in the past rather than what would work for the current situation
22. I was confused by the situation and did the wrong thing
23. I thought something else would happen
24. I did not have the information required to make the right decision

Factor 2: Behavior (e.g., Doing the Wrong Thing/Poor Execution)

1. An error occurred because I did not do what I intended to
2. My actions were not consistent with my intention
3. I meant to do something else
4. I did what I planned to do (reverse scored)
5. I made an error because I was on autopilot
6. I skipped a step which resulted in a mistake
7. I executed the plan flawlessly (reverse scored)
8. I performed the action too quickly

9. I forgot to follow up on something
10. All my actions were correct (reverse scored)
11. Someone else did not do what they were supposed to because I did not follow up with them
12. I did not perform an action because I thought someone else would
13. I forgot to do one or more steps in a plan
14. I did not have the knowledge required to perform appropriately

Factor 3: Latent errors

1. Normally, this error would not have happened
2. External and internal factors lined up and so the error took place
3. There were policies in place that lead to this error
4. With additional policies/guidance this error would not have taken place
5. This event was years in the making
6. I could have easily prevented this event (reverse scored)
7. This event involved several levels of management
8. I am the only person responsible for this event (reverse scored)
9. I am not responsible for this error
10. It will likely take a long time to identify what caused the error
11. It will likely take detailed research to identify what caused the error

Error Severity Scale

Factor 1: Psycho-social Consequences

1. My mistake was embarrassing
2. I am ashamed of what I did
3. My coworkers still like me event after the event (reverse scored)
4. I wish I could fix my mistake
5. The consequences of my mistake made me feel bad
6. I feel like my coworkers do not trust me after the event
7. My coworkers do not talk with me as much
8. The event did not impact my interactions with my coworkers (reverse scored)
9. I do not trust myself anymore
10. I had work responsibilities taken away from me after the event
11. I was publicly reprimanded

Factor 2: Physical Consequences

1. Co-workers had to miss work after the event
2. There was no consequence to my error (reverse scored)
3. People needed medical attention as a result from my mistake
4. There were little to no physical consequences as a result of my actions (reverse scored)
5. My mistake resulted in harm to another person
6. My error *severely* harmed another person

Factor 3: Financial Consequences

1. My error resulted in large financial losses
2. My error resulted in a delay in productivity or production

3. The company was able to quickly fix what happened (reverse scored)
4. Multiple layoffs occurred because of event
5. We had to restart a job task because of the mistake
6. The error cost little to correct (reverse scored)
7. Co-workers had to miss work after the event
8. I lost my job as a result of the event
9. The error took a long time to correct

Demographics. In addition to work experience and proficiency, demographic measures such as gender, age, and educational attainment.

What is the highest degree or level of school you have completed?

1. No schooling completed
2. Nursery school
3. Grades 1 through 11
4. 12th grade—no diploma
5. Regular high school diploma
6. GED or alternative credential
7. Some college credit, but less than 1 year of college
8. 1 or more years of college credit, no degree
9. Associates degree (for example: AA, AS)
10. Bachelor's degree (for example: BA. BS)
11. Master's degree (for example: MA, MS, MEng, MEd, MSW, MBA)
12. Professional degree beyond bachelor's degree (for example: MD, DDS, DVM, LLB, JD)
13. Doctorate degree (for example, PhD, EdD)

How do you prefer to self-describe?

1. Woman
2. Man
3. Non-binary
4. Prefer not to disclose
5. Prefer to self-describe _____

What year were you born? _____

Work Experience/Proficiency: As a validity check, participants will be asked to describe their experience at work in terms of years and proficiency. For the second item responses will range on a seven-point Likert scale from extremely incompetent to extremely proficient.

1. How long have you worked in this field?
2. Please rate your level of proficiency at your job.

NEO Facet - Anger
Agreement Scale:

- Strongly disagree

- Disagree
- Neither agree nor disagree
- Agree
- Strongly agree

Stem: Please indicate the extent to which the following are true for you.
Items:

1. Get angry easily
2. Get irritated easily
3. Get upset easily
4. Am often in a bad mood
5. Lose my temper
6. Rarely get irritated (Reversed Score)
7. Seldom get mad (Reversed Score)
8. Am not easily annoyed (Reversed Score)
9. Keep my cool (Reversed Score)
10. Rarely complain (Reversed Score)

Conscientious

Conscientiousness will be measured with Saucier's Mini-Markers. Eight items will be used from the Mini-Marker to assess conscientiousness. The adjectives are rated on a 9-point scale ranging from extremely inaccurate to extremely accurate.

1. Careless (Reversed Score)
2. Disorganized (Reversed Score)
3. Efficient
4. Inefficient (Reversed Score)
5. Organized
6. Practical
7. Sloppy (Reversed Score)
8. Systematic

Work Locus of Control Scale. (Copyright Paul E. Spector, All rights reserved, 1988)
Scale Prompt: The following questions concern your beliefs about jobs in general. They do not refer only to your present job.
Agreement Scale[3]:

Strongly Disagree
Disagree
Neither Agree nor Disagree
Agree
Strongly Agree

Items:

1. A job is what you make of it. (Reverse)
2. On most jobs, people can pretty much accomplish whatever they set out to accomplish (Reverse)
3. If you know what you want out of a job, you can find a job that gives it to you (reverse)
4. If employees are unhappy with a decision made by their boss, they should do something about it (reverse)
5. Getting the job you want is mostly a matter of luck
6. Making money is primarily a matter of good fortune
7. Most people are capable of doing their jobs well if they make the effort (reverse)
8. In order to get a really good job, you need to have family members or friends in high places
9. Promotions are usually a matter of good fortune
10. When it comes to landing a really good job, who you know is more important than what you know
11. Promotions are given to employees who perform well on the job Reverse
12. To make a lot of money you have to know the right people
13. It takes a lot of luck to be an outstanding employee on most jobs
14. People who perform their jobs well generally get rewarded reverse
15. Most employees have more influence on their supervisors than they think they do reverse
16. The main difference between people who make a lot of money and people who make a little money is luck

Narrative Feedback.
"Please think of the most recent mistake you made at work. Using 2-4 sentences, describe what happened and the outcome."

Social Desirability. The Marlowe–Crowne Social Desirability Scale consists of 33 items. Respondents are asked to indicate whether the item is true or false for them. For example, a respondent will be asked whether "Before voting I through investigate the qualifications of all candidates." The inventory has acceptable reliability (.82-.89) (Crowne & Marlowe, 1960; Reynold, 1982).

[3] Note: Scale is adjusted from a 6 point scale (without neutral) to a 5 point scale to match other scales in the survey.

1. Before voting I thoroughly investigate the qualifications of all the candidates
2. I never hesitate to go out of my way to help someone in trouble
3. It is sometimes hard for me to go on with my work if I am not encouraged
4. I have never intensely disliked anyone
5. On occasions, I have had doubts about my ability to succeed in life
6. I sometimes feel resentful when I don't get my way
7. I am always careful about my manner of dress
8. My table manners at home are as good as when I eat out in a restaurant
9. If I could get into a movie without paying and be sure I was not seen, I would probably do it
10. On a few occasions, I have given up something because I thought too little of my ability
11. I like to gossip at times
12. There have been times when I felt like rebelling against people in authority even though I knew they were right
13. No matter who I'm talking to, I'm always a good listener
14. I can remember "playing sick" to get out of something
15. There have been occasions when I have taken advantage of someone
16. I'm always willing to admit it when I make a mistake
17. I always try to practice what I preach
18. I don't find it particularly difficult to get along with loudmouthed, obnoxious people
19. I sometimes try to get even rather than forgive and forget
20. When I don't know something I don't mind at all admitting it
21. I am always courteous, even to people who are disagreeable
22. At times I have really insisted on having things my own way
23. There have been occasions when I felt like smashing things
24. I would never think of letting someone else be punished for my wrong-doings.
25. I never resent being asked to return a favor
26. I have never been irked when people expressed ideas very different from my own
27. I never make a long trip without checking the safety of my car
28. There have been times when I was quite jealous of the good fortune of others
29. I have almost never felt the urge to tell someone off
30. I am sometimes irritated by people who ask favors of me
31. I have never felt that I was punished without cause
32. I sometimes think when people have a misfortune they only got what they deserved
33. I have never deliberately said something that hurt someone's feelings

STUDY 2 ITEMS:

In addition to the items administered in study 1[4], the following items will be used.

Counterproductive Work Behavior Checklist (CWB-C) (32-item) (Fox & Spector, 2002)

5-point frequency scale

- Never
- Once or twice
- Once or twice per month
- Once or twice per week
- Every day

Stem: How often have you done each of the following things on your present job?

1. Purposely wasted your employer's materials/supplies
2. Purposely did your work incorrectly
3. Came to work late without permission
4. Stayed home from work and said you were sick when you weren't
5. Purposely damaged a piece of equipment or property
6. Purposely dirtied or littered your place of work
7. Stolen something belonging to your employer
8. Started or continued a damaging or harmful rumor at work
9. Been nasty or rude to a client or customer
10. Purposely worked slowly when things needed to get done
11. Taken a longer break than you were allowed to take
12. Purposely failed to follow instructions
13. Left work earlier than you were allowed to
14. Insulted someone about their job performance
15. Made fun of someone's personal life
16. Took supplies or tools home without permission
17. Put in to be paid for more hours than you worked
18. Took money from your employer without permission
19. Ignored someone at work
20. Blamed someone at work for error you made
21. Started an argument with someone at work
22. Stole something belonging to someone at work
23. Verbally abused someone at work
24. Made an obscene gesture (the finger) to someone at work
25. Threatened someone at work with violence
26. Threatened someone at work, but not physically
27. Said something obscene to someone at work to make them feel bad
28. Did something to make someone at work look bad
29. Played a mean prank to embarrass someone at work
30. Looked at someone at work's private mail/property without permission

[4] Study 1 items may be modified or excluded as a result of psychometric exploration. Provided that social desirability bias is not evident, the Marlowe-Crowne Social Desirability Scale will be excluded.

31. Hit or pushed someone at work
32. Insulted or made fun of someone at work

Scoring: To score the CWB-C, sum responses to each item for the particular subscale as shown in the table below.

Subscale	Items to sum
Abuse	8, 9, 14, 15, 19, 20, 21, 23-32
Production deviance	2, 10, 12
Sabotage	1, 5, 6
Theft	7, 16, 17, 18, 22
Withdrawal	3, 4, 11, 13
Total	All items

Burnout.

Burnout will be measured with the Oldenburg Burnout Inventory which consists of 16 items.

Agreement Scale[5]:
Strongly Disagree
Disagree
Neither Agree nor Disagree
Agree
Strongly Agree

1. I always find new and interesting aspects in my work (D)
2. There are days when I feel tired before I arrive at work (E.R.)
3. It happens more and more often that I talk about my work in a negative way (D.R)
4. After work, I tend to need more time than in the past in order to relax and feel better (E.R)
5. I can tolerate the pressure of my work very well (E)
6. Lately, I tend to think less at work and do my job almost mechanically (D.R)
7. I find my work to be a positive challenge (D)
8. During my work, I often feel emotionally drained (E.R.)
9. Over time, one can become disconnected from this type of work (D.R)
10. After working, I have enough energy for my leisure activities (E)
11. Sometimes I feel sickened by my work tasks (D.R)
12. After my work, I usually feel worn out and weary (E.R)
13. This is the only type of work that I can imagine myself doing (D)
14. Usually, I can manage the amount of my work well (E)
15. I feel more and more engaged in my work (D)
16. When I work, I usually feel energized (E)

[5] Note: Response scale was adjusted from 4 points to 5 points to match the other survey response scales in the study.

Rumination. Rumination on error will be measured by the Response Style Questionnaire (Nolen-Hoeksema,1991) and the Error Specific Rumination (Horowitz, Wilner, & Alvarez, 1979)

Response Style Questionnaire
Scoring:
Items 1, 3, 5, 7, 8, 10 make up the Cognitive Reappraisal facet.
Items 2, 4, 6, 9 make up the Expressive Suppression facet.
Scoring is kept continuous.
Each facet's scoring is kept separate.

People think and do many different things when they feel depressed. Please read each of the items below and indicate whether you almost never, sometimes, often, or almost always think or do each one when you feel down, sad, or depressed. Please indicate what you generally do, not what you think you should do.
1 almost never 2 sometimes 3 often 4 almost always

1. think about how alone you feel
2. think "I won't be able to do my job if I don't snap out of this"
3. think about your feelings of fatigue and achiness
4. think about how hard it is to concentrate
5. think "What am I doing to deserve this?"
6. think about how passive and unmotivated you feel.
7. analyze recent events to try to understand why you are depressed
8. think about how you don't seem to feel anything anymore
9. think "Why can't I get going?"
10. think "Why do I always react this way?"
11. go away by yourself and think about why you feel this way
12. write down what you are thinking about and analyze it
13. think about a recent situation, wishing it had gone better
14. think "I won't be able to concentrate if I keep feeling this way."
15. think "Why do I have problems other people don't have?"
16. think "Why can't I handle things better?"
17. think about how sad you feel.
18. think about all your shortcomings, failings, faults, mistakes
19. think about how you don't feel up to doing anything
20. analyze your personality to try to understand why you are depressed
21. go someplace alone to think about your feelings
22. think about how angry you are with yourself

Error Specific Rumination

(McCullough, Bono, & Root, 2007)
How often have you had the following experiences within the past 24 hours?

1. I couldn't stop thinking about the error I made
2. Thoughts and feelings about the error I made kept running through my head
3. Strong feelings about the error I made kept bubbling up
4. Memories of the error I made kept coming back to me
5. Images of the error I made kept coming back to me
6. I brooded about the error I made
7. I found it difficult not to think about the error I made
8. Even when I was engaged in other tasks, I thought about the error I made
9. I found myself playing the error I made over and over in my mind

APPENDIX B: STUDY 1 DESCRIPTIVE STATISTICS

Table 23: Study 1 Descriptive Statistics

Item	Stand dev	Mean	n	Median	Min	Max	Skewness
PES_1	1.118	3.820	440	4	1	5	-1.013
PES_2	1.204	1.995	440	2	1	5	1.084
PES_3	1.173	2.232	440	2	1	5	0.602
PES_4	1.320	2.550	440	2	1	5	0.308
PES_5	1.342	3.102	440	3	1	5	-0.255
PES_6	1.295	2.702	440	3	1	5	0.162
PES_7	1.157	4.000	440	4	1	5	-1.236
PES_8	1.000	4.082	440	4	1	5	-0.903
PES_9	1.115	3.850	440	4	1	5	-0.984
PES_10	1.280	3.466	440	4	1	5	-0.606
PES_11	1.279	3.514	440	4	1	5	-0.665
PES_12	1.103	1.875	440	2	1	5	1.197
PES_13	1.280	2.550	440	2	1	5	0.349
PES_14	1.429	2.909	440	3	1	5	-0.013
PES_15	1.012	3.995	440	4	1	5	-0.861
PES_16	1.372	2.339	440	2	1	5	0.604
PES_17	1.218	1.939	440	1	1	5	1.155
PES_18	1.166	2.300	440	2	1	5	0.480
PES_19	1.307	2.680	440	3	1	5	0.123
PES_20	1.182	2.130	440	2	1	5	0.800
PES_21	1.260	2.291	440	2	1	5	0.576
PES_22	1.319	2.398	440	2	1	5	0.559
PES_23	1.209	1.932	440	1	1	5	1.183
PES_24	1.335	3.495	440	4	1	5	-0.623
PES_25	1.267	3.732	440	4	1	5	-0.840
PES_26	1.425	3.261	440	4	1	5	-0.306
PES_27	1.226	3.725	440	4	1	5	-0.586
PES_28	1.297	3.498	440	4	1	5	-0.642
PES_29	1.449	3.005	440	3	1	5	-0.143
PES_30	0.897	4.343	440	5	1	5	-1.449
PES_31	1.303	3.655	440	4	1	5	-0.838
PES_32	1.455	2.670	440	2	1	5	0.265
PES_33	0.919	4.166	440	4	1	5	-1.197
PES_34	1.001	1.702	440	1	1	5	1.617
PES_35	0.839	1.550	440	1	1	5	1.766

PES_36	1.404	3.220	440	4	1	5	-0.312
PES_37	1.113	1.777	440	1	1	5	1.409
PES_38	0.900	4.205	440	4	1	5	-1.314
PES_39	1.307	2.507	440	2	1	5	0.328
PES_40	1.061	1.759	440	1	1	5	1.384
PES_41	1.240	2.211	440	2	1	5	0.806
PES_42	0.685	1.348	440	1	1	5	2.329
PES_43	0.886	1.757	440	2	1	5	1.398
PES_44	1.164	1.909	440	2	1	5	1.202
PES_45	1.087	1.814	440	1	1	5	1.354
PES_46	0.959	1.570	440	1	1	5	2.032
PES_47	0.853	1.470	440	1	1	5	2.262
PES_48	1.001	1.666	440	1	1	5	1.647
Severity_1	1.225	3.684	440	4	1	5	-0.928
Severity_2	1.342	3.002	440	3	1	5	-0.100
Severity_3	0.984	1.818	440	2	1	5	1.675
Severity_4	1.072	3.711	440	4	1	5	-0.696
Severity_5	1.286	3.470	440	4	1	5	-0.636
Severity_6	0.959	1.680	440	1	1	5	1.452
Severity_7	0.782	1.443	440	1	1	5	1.933
Severity_8	1.207	2.175	440	2	1	5	0.953
Severity_9	0.848	1.666	440	1	1	5	1.435
Severity_10	0.770	1.407	440	1	1	5	2.368
Severity_11	0.996	1.639	440	1	1	5	1.615
Severity_12	1.241	2.966	440	3	1	5	-0.007
Severity_13	0.568	1.220	440	1	1	4	3.045
Severity_14	1.258	3.930	440	4	1	5	-1.111
Severity_15	0.851	1.502	440	1	1	5	1.857
Severity_16	0.739	1.380	440	1	1	5	2.319
Severity_17	0.866	1.532	440	1	1	5	1.690
Severity_18	1.403	2.916	440	3	1	5	-0.113
Severity_19	1.098	2.295	440	2	1	5	0.821
Severity_20	0.622	1.239	440	1	1	5	3.421
Severity_21	1.396	2.243	440	2	1	5	0.704
Severity_22	1.058	2.061	440	2	1	5	0.929
Severity_23	0.665	1.309	440	1	1	5	2.727
Severity_24	0.534	1.202	440	1	1	5	3.565
Severity_25	1.046	1.880	440	2	1	5	1.162
Q14_1	1.037	2.009	440	2	1	5	0.939
Q14_2	1.232	2.486	440	2	1	5	0.471

Q14_3	1.130	2.200	440	2	1	5	0.816
Q14_4	0.975	1.943	440	2	1	5	0.984
Q14_5	1.019	1.964	440	2	1	5	1.005
Q14_6	1.203	3.243	440	4	1	5	-0.271
Q14_7	1.078	3.568	440	4	1	5	-0.652
Q14_8	1.193	3.259	440	4	1	5	-0.300
Q14_9	0.959	3.977	440	4	1	5	-1.056
Q14_10	1.116	3.561	440	4	1	5	-0.593
Q15_1	1.742	2.743	440	2	1	9	1.324
Q15_2	1.975	2.918	440	2	1	9	1.129
Q15_3	1.263	7.502	440	8	1	9	-1.762
Q15_4	1.544	2.395	440	2	1	9	1.799
Q15_5	1.729	7.011	440	7	1	9	-1.234
Q15_6	1.156	7.591	440	8	1	9	-1.383
Q15_7	1.775	2.623	440	2	1	9	1.219
Q15_8	1.409	6.986	440	7	1	9	-0.968
Q16_1	0.839	1.998	440	2	1	5	1.093
Q16_2	0.913	2.350	440	2	1	5	0.924
Q16_3	0.841	2.250	440	2	1	5	1.067
Q16_4	0.780	2.416	440	2	1	5	0.454
Q16_5	1.119	2.714	440	2.5	1	5	0.327
Q16_6	1.151	2.770	440	3	1	5	0.348
Q16_7	0.668	1.809	440	2	1	5	1.019
Q16_9	1.169	2.689	440	2.5	1	5	0.332
Q16_10	1.058	2.727	440	2	1	5	0.375
Q16_11	1.124	3.325	440	3	1	5	-0.268
Q16_12	0.909	2.218	440	2	1	5	0.848
Q16_13	1.150	3.152	440	3	1	5	-0.156
Q16_14	1.067	2.318	440	2	1	5	0.694
Q16_15	0.917	2.245	440	2	1	5	0.825
Q16_16	1.043	2.795	440	3	1	5	0.416
Q16_17	1.098	2.625	440	2	1	5	0.420
Q17_1	0.976	3.830	440	4	1	5	-0.831
Q17_2	1.058	3.470	440	4	1	5	-0.413
Q17_3	1.240	2.784	440	3	1	5	0.063
Q17_4	1.163	2.155	440	2	1	5	0.985
Q17_5	1.242	3.355	440	4	1	5	-0.459
Q17_6	1.149	3.257	440	4	1	5	-0.531
Q17_7	1.120	3.418	440	4	1	5	-0.515
Q17_8	1.242	3.414	440	4	1	5	-0.392

Q17_9	1.336	2.493	440	2	1	5	0.442
Q17_10	1.262	3.175	440	4	1	5	-0.291
Q17_11	1.231	3.041	440	3	1	5	-0.357
Q17_12	1.248	2.818	440	3	1	5	-0.019
Q17_13	1.125	3.527	440	4	1	5	-0.563
Q17_14	1.319	3.407	440	4	1	5	-0.676
Q17_15	1.231	3.023	440	3	1	5	-0.278
Q17_16	1.055	3.902	440	4	1	5	-1.027
Q17_17	0.817	4.050	440	4	1	5	-1.272
Q17_18	1.122	2.441	440	2	1	5	0.429
Q17_19	1.326	2.634	440	2	1	5	0.288
Q17_20	0.947	4.014	440	4	1	5	-1.234
Q17_21	1.102	3.536	440	4	1	5	-0.654
Q17_22	0.948	3.589	440	4	1	5	-0.930
Q17_23	1.322	3.007	440	3	1	5	-0.220
Q17_24	0.940	4.107	440	4	1	5	-1.251
Q17_25	1.184	3.045	440	3	1	5	0.036
Q17_26	1.095	2.500	440	2	1	5	0.647
Q17_27	1.201	3.532	440	4	1	5	-0.493
Q17_28	1.171	3.523	440	4	1	5	-0.762
Q17_29	1.134	2.357	440	2	1	5	0.619
Q17_30	1.133	3.205	440	4	1	5	-0.407
Q17_31	1.158	2.664	440	2	1	5	0.327
Q17_32	1.113	2.789	440	3	1	5	0.036

APPENDIX C: STUDY 2 DESCRIPTIVE STATISTICS

Item	Stand dev	Mean	n	Median	Min	Max	Skewness	Kurtosis.
PES_1	1.114	3.882	314	4	1	5	-1.085	0.586
PES_2	1.098	1.955	314	2	1	5	1.074	0.297
PES_3	1.271	2.398	314	2	1	5	0.458	-0.951
PES_4	1.273	2.650	314	2	1	5	0.249	-1.174
PES_5	1.322	3.239	314	4	1	5	-0.387	-1.051
PES_6	1.282	2.924	314	3	1	5	-0.049	-1.151
PES_7	1.086	4.096	314	4	1	5	-1.419	1.506
PES_8	0.909	4.134	314	4	1	5	-1.060	1.086
PES_9	1.177	3.803	314	4	1	5	-1.049	0.298
PES_10	1.275	3.678	314	4	1	5	-0.893	-0.341
PES_11	1.257	3.608	314	4	1	5	-0.767	-0.536
PES_12	1.100	1.882	314	2	1	5	1.215	0.580
PES_13	1.297	2.471	314	2	1	5	0.380	-1.132
PES_14	1.386	2.984	314	3	1	5	-0.109	-1.348
PES_15	0.949	4.067	314	4	1	5	-0.921	0.516
PES_16	1.375	2.443	314	2	1	5	0.560	-1.032
PES_17	1.216	1.978	314	2	1	5	1.078	0.009
PES_18	1.274	2.408	314	2	1	5	0.523	-0.834
PES_19	1.357	2.662	314	3	1	5	0.158	-1.337
PES_20	1.253	2.296	314	2	1	5	0.570	-0.874
PES_21	1.237	2.277	314	2	1	5	0.650	-0.744
PES_22	1.316	2.414	314	2	1	5	0.570	-0.862
PES_23	1.266	2.019	314	2	1	5	1.033	-0.193
PES_24	1.321	3.468	314	4	1	5	-0.572	-0.867
PES_25	1.280	3.748	314	4	1	5	-0.876	-0.268
PES_26	1.390	3.264	314	4	1	5	-0.394	-1.187
PES_27	1.184	3.691	314	4	1	5	-0.483	-0.942
PES_28	1.254	3.726	314	4	1	5	-0.952	-0.143
PES_29	1.436	3.137	314	4	1	5	-0.209	-1.373
PES_30	0.798	4.401	314	5	1	5	-1.600	3.336
PES_31	1.277	3.682	314	4	1	5	-0.874	-0.327
PES_32	1.419	2.697	314	2	1	5	0.201	-1.400
PES_33	0.843	4.223	314	4	1	5	-1.273	2.076
PES_34	0.928	1.646	314	1	1	5	1.620	2.348
PES_35	0.867	1.557	314	1	1	5	1.986	4.320
PES_36	1.382	3.268	314	4	1	5	-0.407	-1.173
PES_37	1.131	1.764	314	1	1	5	1.546	1.494

PES_38	0.857	4.245	314	4	1	5	-1.193	1.449
PES_39	1.342	2.745	314	3	1	5	0.042	-1.306
PES_40	0.996	1.752	314	1	1	5	1.328	1.010
PES_41	1.270	2.248	314	2	1	5	0.690	-0.691
PES_42	0.712	1.363	314	1	1	4	2.166	4.459
PES_43	0.912	1.726	314	2	1	5	1.427	1.975
PES_44	1.170	1.876	314	1	1	5	1.202	0.306
PES_45	1.121	1.879	314	2	1	5	1.248	0.594
PES_46	0.892	1.570	314	1	1	5	2.062	4.642
PES_47	0.830	1.446	314	1	1	5	2.339	5.836
PES_48	0.951	1.573	314	1	1	5	1.768	2.438
Severity_1	1.131	3.768	314	4	1	5	-0.864	-0.071
Severity_2	1.327	2.920	314	3	1	5	-0.084	-1.280
Severity_3	0.872	1.666	314	1	1	5	1.803	4.057
Severity_4	1.055	3.742	314	4	1	5	-0.846	0.522
Severity_5	1.311	3.548	314	4	1	5	-0.718	-0.661
Severity_6	0.959	1.646	314	1	1	5	1.539	1.818
Severity_7	0.724	1.379	314	1	1	5	2.378	6.739
Severity_8	1.158	2.032	314	2	1	5	1.063	0.238
Severity_9	0.877	1.637	314	1	1	5	1.486	2.002
Severity_10	0.824	1.420	314	1	1	5	2.349	5.635
Severity_11	0.978	1.602	314	1	1	5	1.829	2.897
Severity_12	1.290	3.022	314	3	1	5	-0.131	-1.195
Severity_13	0.678	1.220	314	1	1	5	3.583	13.471
Severity_14	1.178	4.041	314	4	1	5	-1.289	0.784
Severity_15	0.933	1.529	314	1	1	5	1.964	3.335
Severity_16	0.857	1.408	314	1	1	5	2.470	6.082
Severity_17	0.922	1.583	314	1	1	5	1.725	2.510
Severity_18	1.448	3.083	314	4	1	5	-0.290	-1.381
Severity_19	1.118	2.239	314	2	1	5	0.895	0.219
Severity_20	0.610	1.223	314	1	1	5	3.396	12.842
Severity_21	1.479	2.236	314	2	1	5	0.736	-1.052
Severity_22	1.044	2.022	314	2	1	5	1.020	0.486
Severity_23	0.751	1.306	314	1	1	5	3.102	10.442
Severity_24	0.522	1.175	314	1	1	5	3.830	17.792
Severity_25	1.083	1.904	314	2	1	5	1.173	0.578
RespStyleQ_1	0.898	1.908	314	2	1	4	0.739	-0.244
RespStyleQ_2	0.000	1.690	314	--	--	--	1.087	0.482
RespStyleQ_3	0.898	2.182	314	2	1	4	0.351	-0.635
RespStyleQ_4	0.000	1.984	314	--	--	--	0.679	-0.234

RespStyleQ_5	0.000	1.703	314	--	--	--	1.081	0.235
RespStyleQ_6	0.000	2.112	314	--	--	--	0.553	-0.515
RespStyleQ_7	0.894	2.099	314	2	1	4	0.451	-0.544
RespStyleQ_8	0.899	1.691	314	1	1	4	1.095	0.193
RespStyleQ_9	0.913	2.080	314	2	1	4	0.498	-0.559
RespStyleQ_10	0.914	1.815	314	2	1	4	0.851	-0.244
RespStyleQ_11	0.923	1.898	314	2	1	4	0.764	-0.312
RespStyleQ_12	0.000	1.393	314	--	--	--	1.996	3.553
RespStyleQ_13	0.838	2.452	314	2	1	4	0.265	-0.513
RespStyleQ_14	0.000	1.837	314	--	--	--	0.726	-0.238
RespStyleQ_15	0.926	1.809	314	2	1	4	0.894	-0.186
RespStyleQ_16	0.960	1.959	314	2	1	4	0.669	-0.573
RespStyleQ_17	0.933	1.930	314	2	1	4	0.754	-0.314
RespStyleQ_18	1.007	2.194	314	2	1	4	0.470	-0.833
RespStyleQ_19	0.912	2.054	314	2	1	4	0.628	-0.330
RespStyleQ_20	0.000	1.843	314	--	--	--	0.861	-0.157
RespStyleQ_21	0.926	1.965	314	2	1	4	0.697	-0.361
RespStyleQ_22	0.949	1.812	314	2	1	4	0.966	-0.063
Burnout_1	1.073	2.611	314	2	1	5	0.556	-0.585
Burnout_2	0.994	3.895	314	4	1	5	-1.194	1.187
Burnout_3	1.240	2.672	314	2	1	5	0.228	-1.135
Burnout_4	1.285	2.818	314	3	1	5	0.133	-1.197
Burnout_5	0.873	2.134	314	2	1	5	0.691	0.258
Burnout_6	1.219	3.022	314	3	1	5	-0.064	-1.170
Burnout_7	1.131	2.637	314	2	1	5	0.454	-0.719
Burnout_8	1.290	2.949	314	3	1	5	0.041	-1.207
Burnout_9	1.181	3.344	314	4	1	5	-0.515	-0.687
Burnout_10	1.104	2.672	314	2	1	5	0.346	-0.799
Burnout_11	1.200	2.134	314	2	1	5	0.709	-0.728
Burnout_12	1.223	3.188	314	3	1	5	-0.152	-1.052
Burnout_13	1.285	3.436	314	4	1	5	-0.473	-0.917
Burnout_14	0.843	1.908	314	2	1	5	1.234	2.386
Burnout_15	1.126	2.990	314	3	1	5	0.005	-0.938
Burnout_16	1.121	2.889	314	3	1	5	0.111	-0.837
Rumination_1	1.396	2.331	314	2	1	5	0.470	-1.340
Rumination_2	1.410	2.382	314	2	1	5	0.440	-1.341
Rumination_3	1.309	2.076	314	2	1	5	0.878	-0.624
Rumination_4	0.000	2.227	314	--	--	--	0.631	-1.078
Rumination_5	0.000	2.116	314	--	--	--	0.763	-0.877
Rumination_6	0.000	2.198	314	--	--	--	0.659	-1.024

Rumination_7	1.347	2.188	314	2	1	5	0.669	-1.020
Rumination_8	1.338	2.182	314	2	1	5	0.643	-1.066
Rumination_9	1.357	2.182	314	2	1	5	0.690	-1.005
CWB_1	0.640	1.245	314	1	1	5	3.105	10.391
CWB_2	0.523	1.131	314	1	1	5	4.712	23.942
CWB_3	0.873	1.908	314	2	1	5	0.873	0.520
CWB_4	0.749	1.717	314	2	1	5	1.381	3.375
CWB_5	0.540	1.121	314	1	1	5	4.953	25.143
CWB_6	0.583	1.134	314	1	1	5	4.822	23.718
CWB_7	0.584	1.172	314	1	1	5	4.201	19.525
CWB_8	0.548	1.159	314	1	1	5	4.388	22.215
CWB_9	0.637	1.293	314	1	1	4	2.406	5.795
CWB_10	0.909	1.637	314	1	1	5	1.341	1.069
CWB_11	1.023	2.331	314	2	1	5	0.685	0.097
CWB_12	0.750	1.338	314	1	1	5	2.632	7.351
CWB_13	0.976	1.901	314	2	1	5	1.067	0.845
CWB_14	0.631	1.261	314	1	1	5	3.017	10.336
CWB_15	0.694	1.344	314	1	1	5	2.521	7.429
CWB_16	0.800	1.475	314	1	1	5	1.977	4.193
CWB_17	0.823	1.287	314	1	1	5	3.280	10.599
CWB_18	0.587	1.115	314	1	1	5	5.479	30.328
CWB_19	0.796	1.790	314	2	1	5	1.155	2.041
CWB_20	0.608	1.220	314	1	1	5	3.430	13.059
CWB_21	0.688	1.360	314	1	1	4	2.219	5.074
CWB_22	0.518	1.115	314	1	1	5	4.999	26.088
CWB_23	0.588	1.169	314	1	1	4	3.830	14.525
CWB_24	0.742	1.303	314	1	1	5	2.837	8.086
CWB_25	0.522	1.096	314	1	1	5	5.805	34.344
CWB_26	0.545	1.127	314	1	1	5	4.944	26.158
CWB_27	0.520	1.143	314	1	1	4	4.142	17.870
CWB_28	0.628	1.207	314	1	1	5	3.839	16.586
CWB_29	0.502	1.127	314	1	1	5	4.783	25.455
CWB_30	0.565	1.188	314	1	1	4	3.524	13.085
CWB_31	0.462	1.086	314	1	1	5	5.975	37.652
CWB_32	0.830	1.443	314	1	1	5	2.149	4.505

APPENDIX D: IRB LETTER

Notification of Exempt Certification

From:	Social/Behavioral IRB
To:	Anne Carroll
CC:	Alexander Schoemann
Date:	12/22/2020
Re:	UMCIRB 18-000711

Employee Error: The Development, Validation and Use of a Perceived Error Scale

I am pleased to inform you that your research submission has been certified as exempt on 12/21/2020. This study is eligible for Exempt Certification under category # 2ab.

It is your responsibility to ensure that this research is conducted in the manner reported in your application and/or protocol, as well as being consistent with the ethical principles of the Belmont Report and your profession.

This research study does not require any additional interaction with the UMCIRB unless there are proposed changes to this study. Any change, prior to implementing that change, must be submitted to the UMCIRB for review and approval. The UMCIRB will determine if the change impacts the eligibility of the research for exempt status. If more substantive review is required, you will be notified within five business days.

Document	Description
Carroll - Dissertation Proposal (January 2020)(0.01)	Study Protocol or Grant Application
Consent Form V2(0.02)	Consent Forms
MTurk Recruitment SOP Script(0.02)	Recruitment Documents/Scripts
Study Phases 1 & 2 Items_V2(0.03)	Surveys and Questionnaires

For research studies where a waiver or alteration of HIPAA Authorization has been approved, the IRB states that each of the waiver criteria in 45 CFR 164.512(i)(1)(i)(A) and (2)(i) through (v) have been met. Additionally, the elements of PHI to be collected as described in items 1 and 2 of the Application for Waiver of Authorization have been determined to be the minimal necessary for the specified research.

The Chairperson (or designee) does not have a potential for conflict of interest on this study.

IRB00000705 East Carolina U IRB #1 (Biomedical) IORG0000418

IRB00003781 East Carolina U IRB #2 (Behavioral/SS) IORG0000418

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Study.PI Name:

Study.Co-Investigators: