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Exploring the Relationship Between Commuting Stress, Job Strain and Safety Behaviors While Commuting: The Dual Role of Work-Related Rumination

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Exploring the Relationship Between Commuting Stress, Job Strain and Safety Behaviors While Commuting: The Dual Role of Work-Related Rumination

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Abstract

For those who commute to and from work on a daily basis, this is an activity that requires attention to both what one is doing and the environment, in order for the commute to be done safely. Although research has shown that work can spill over into home and other non-work domains, very little attention has been paid to the impact that work may have on the transition time between one's work and home domains. The present study sought to examine the impact of daily commuting stress and end-of-day job strain on the safety of one's commute through the experience of work-related rumination. Data were collected via daily diaries administered over two working weeks from employees (N = 106) who worked full-time and commuted by private vehicle on a daily basis. Utilizing a daily diary approach allowed for the examination of both inter- and intra- individual variability in the study constructs of interest, in an effort to understand the dynamics of the hypothesized phenomena. Results indicate that at both the inter- and intra- individual levels, commuting stress impacts safety behaviors during the commute; and job strain spills over to impact safety behaviors while commuting, partially mediated by the experiences of work-related affective rumination. Furthermore, work-related affective rumination exacerbates the impact that an already stressful commute can have on one's commuting safety behaviors. Findings suggest that the spillover between one's work attitudes and experiences into the commute have the potential to impair the safety of employee outside the workplace. Practical implications and future research are discussed.

Keywords: commuting stress, job strain, work-related rumination, commuting safety behaviors, daily diary, spillover

Introduction

Commuting constitutes an unavoidable aspect of most working adults' everyday life. Currently, there are approximately 139 million people (noninstitutional civilians) employed in the United States and of that 139 million, approximately 136 million commute to work (US Census Bureau, 2009). The mode of transportation varies, with the overwhelming majority commuting by private vehicle alone, and the average person spending an estimated 50 minutes commuting to and from their place of business (US Census Bureau, 2009). For those individuals who work in urbanized areas, the average commute time increases dramatically. In urbanized areas, where traffic congestion is greater, people can spend an additional 25 hours commuting annually (US Census Data, 2009).

Stress as a result of commuting has been well documented (e.g., Novaco, Stokols, Campbell, & Stokols, 1979; Sposato, Röderer, & Cervinka, 2012). Past research has primarily focused on attributes of the commuting experience and antecedents to the commuting experience that contributes to commuting stress. Less attention has been paid to identifying and documenting outcomes of commuting stress. Furthermore, the limited research literature on this topic has produced inconsistent results. Concerted efforts to understand proximal and distal consequences of commuting stress, and methodologies that capture daily fluctuations that are endemic to the commuting experience, may shed light on how the commuting experience affects the daily lives of working adults.

One potential proximal outcome of commuting stress is safety behaviors while commuting; however, evidence for the role of commuting stress in commuting safety behaviors has yet to be examined. Furthermore, it is possible and likely that the strain experienced as a result of demands at work will also have an effect on safety behaviors during the commute as the commute represents the physical transition from the work domain to the home domain. In fact, there is some evidence that work experiences, such as time pressure and concentration demands, may contribute to risky commuting safety behaviors (e.g., accidental overlooking of stop signs, violation of the right of way of others; Elfering, Grebner, & Haller, 2012). Moreover, excessive feelings of job strain at the end of the day may spill over and lead individuals to engage in work-related rumination during the commute. By utilizing cognitive resources that could otherwise be devoted to the commuting task, non-task-related cognitive activities taking place during the commute (such as work-related rumination) may serve as a distraction that interferes with an operator's ability to devote full attention to the driving task. This suggests a pathway by which work experiences, and rumination associated with those experiences, may result in risky commuting safety behaviors.

I propose to examine the roles of commuting stress, job strain, and rumination, respectively, as possible influences on commuting safety behaviors. Specifically, I aim to examine the direct effect of commuting stress on commuting safety behaviors as well as the indirect effect of job strain on commuting safety behaviors through work-related rumination during the commute. Additionally, I will explore whether work-related rumination acts as a moderator that exacerbates the direct effect of commuting stress on commuting safety behaviors. The conceptual model that guides this research, which is elaborated in the following sections, is summarized in Figure 1.

Review of the Commuting Stress Literature

Stress can be framed in either biological (stimulus and response) or psychological terms. Psychological stress is defined as "a particular relationship between the person and the environment that is appraised by the person as taxing or exceeding his or her resources and endangering his or her well-being" (Lazarus & Folkman, 1984, pg. 19). For the present study, I focus on commuting stress as a subjective, psychological factor that can impact one's safety behaviors while commuting. Extending Lazarus and Folkman's (1984) definition of stress, commuting stress can be defined as the stress that results when the commuter appraises the environment and conditions of commuting as exhausting his or her resources and endangering his or her well-being. Thus, the experience of commuting stress for the individual is a strain response to the experience of commuting demands (stressors) following a stressor-strain model.

Past research has focused on both the objective and subjective stressors of the commute that contribute to commuting stress. Objective stressors that have been found to significantly predict commuting stress include: time spent commuting (Gottholmseder, Nowotny, Pruckner, & Theurl, 2009; Kluger, 1998; Alton, 2006; Morrow, 2010; Novaco & Collier, 1994; Novaco, Stokols, & Milanesi, 1990; Sposato, Röderer, & Cervinka, 2012), speed (Rasmussen, Knapp, & Garner, 2000), traffic congestion (Novaco et al., 1990), and distance of the commute (Kluger, 1998). Further, many have focused on the notion of impedance and its role in commuting stress (Gottholmseder et al., 2009; Kluger, 1998; Novaco et al., 1990; Sposato et. al., 2012). Impedance was first defined by Novaco, Stokols, Campbell, and Stokols (1979) as a behavioral constraint on the individual due to the time spent commuting and the distance of the commute. They found that those with greater impedance (i.e., longer time spent commuting combined with greater distance of the commute) indicated significantly more negative moods (tense, irritable, nervous, and impatient) which they conceptualized as indicators of stress. Additional subjective stressors that have been found to significantly predict commuting stress include: low predictability of the commute (Evans, Wener, & Phillips, 2002; Gottholmseder et al., 2009; Novaco et al., 1990;

Sposato et al., 2012), low perceived control (Gottholmseder et al., 2009; Sposato et al., 2012; Wener & Evans, 2011), and greater effort (Wener & Evans, 2011).

Turning to potential outcomes of commuting stress, a few researchers have focused on commuting stress as an antecedent of outcomes in the work and home domains (i.e., the domains to which the commuter transitions). In the work domain, past research has shown that commuting stress may have direct links to one's: intent to turnover and job satisfaction (Koslowsky & Krausz, 1993), task performance (Novaco, Stokols, Campbell, & Stokols, 1979), task motivation (Wener, Evans, Phillips, & Nadler, 2003), negative mood upon arriving to work (Wener & Evans, 2011), and aggression in the workplace (Hennessey, 2008). In the home domain, past research has shown that commuting stress may have direct links to one's: negative at-home mood (Novaco et al., 1990) and more need to wind down upon arriving home (Novaco & Collier, 1994). However, findings linking commuting stress to outcomes in other domains have been inconsistent. For instance, Novaco, Stokols, and Milanesi (1990) evaluated the potential differential effects of physical (defined as commuting time and distance) and subjective impedance (defined as traffic congestion, averseness to travel and street constraints) on commuting stress and outcomes associated with the work domain. They found that physical impedance did not significantly predict bad mood upon arriving to the job, job dissatisfaction or desire to change employment, but did significantly predict stressful responses to the commute (e.g., increased blood pressure and lower frustration tolerance). Similar results were found for subjective impedance. On the other hand, Novaco and Collier (1994) sought to examine the impact of commuting stress in private vehicle travel, and the potential buffering effects of ride-sharing, with a large sample of southern California residents (N = 2591). They found that those who commute longer distances to work (> 20 miles) reported significantly more stress from the commute, and of those that commuted longer distances, women (but not men) reported more need to wind down upon arriving to work.

Safety Behaviors as a Proximal Outcome of Commuting Stress

One reason that evidence linking commuting stress to outcomes in the work and home domains is inconsistent may be that researchers have primarily focused on potential distal outcomes of commuting stress (e.g., intent to turnover, job satisfaction, and home satisfaction). Commuting constitutes a transition between domains and thus, proximal outcomes that occur during or immediately following the commute may evidence more consistent relationships. One potential proximal outcome of commuting stress is risky safety behaviors while commuting, as this potential outcome occurs during the commute transition itself. Following a stressor-strain model, risky commuting safety behaviors can be viewed as a behavioral response to strain, where the strain is the experience of commuting stress resulting from commuting demands (stressors).

Conservation of resources (COR) theory provides a theoretical basis for understanding why commuting stress should impact safety behaviors while commuting. The central tenet of COR theory (Höbfall, 1989) is that people strive to keep, protect, and build resources and that stress results from the potential or actual loss of resources. Stress is situation-specific and often environmental circumstances threaten or drain resources. Commuting stress can be conceptualized as an environmental circumstance that actively depletes resources, such as attention, that one could otherwise be paying to the external commuting environment. Indeed, stress can be particularly detrimental to individuals because it works to affect their psychological and/or physical well-being. Research that has been conducted in the work environment demonstrates that when employees experience reduced levels of psychological or physical well-being, they may be especially prone to accidents. Accidents may occur due to increased distraction, cognitive failure, emotional exhaustion, and lowered concentration, resulting in a greater likelihood to commit errors (Fogarty & McKeon, 2006) and procedural violations (Halbesleben, 2010). Extrapolating this research to the commute would suggest that commuting stress is taxing to the individual, and thus may have significant implications for risky safety behaviors while commuting.

Consistent with this position, examination of the driver stress literature reveals that those who experience stress while driving [defined as reactions to the thought of driving being demanding or dangerous; Gulian, Matthews, Glendon, Davies, & Debney, 1989] are more prone to committing driving errors, lapses and violations, and as a result, are more prone to accidents (Rowden, Matthews, Watson, & Biggs, 2011; Westerman & Haigney, 2000). However, it should be noted that studies of driver stress typically examine populations of professional drivers (people who drive as part of their work task; e.g., tow truck drivers) rather than individuals who drive as an adjunct to their main job. More research is needed on the potential detriments of everyday commuting stress for those who commute to and from work on safety behaviors while commuting. Based on COR theory and the reasoning presented above, I propose the following hypothesis:

H1: Commuting stress will be positively associated with commuting lapses, errors, and violations.

Spillover of Job Strain

The theory of spillover between work and non-work domains was first discussed by Wilensky (1960) who coined the term “spillover-leisure hypothesis.” The spillover-leisure hypothesis states that attitudes and behaviors developed in one sphere of life can spill over into another sphere of life (Wilensky, 1960). Typically, spillover is discussed in terms of work and family; what happens in the work domain can "spill over" into the family domain and vice-versa because one's behaviors and attitudes aren't necessarily bounded, and can transfer as a result (Champoux, 1978; Zedeck, 1992). Spillover of attitudes and behaviors between domains can be both positive and negative. There is a significant body of work demonstrating that attitudes and behaviors developed in the work domain can spillover into non-work domains (e.g., Andreassen, Hetland, & Palleson, 2013; Carlson, Ferguson, Perrewé, & Whitten, 2011; Sonnentag & Binnewies, 2013). One such work attitude that may transfer or spillover into non-work domains is job strain. Job strain is defined as the depletion of energy often characterized as a state of exhaustion which can be physical, emotional or cognitive; and occurs in employees as a result of greater job demands (which act to exhaust one's physical, emotional, and cognitive resources) which create stress for the employee (Bakker, Demerouti, & Schaufeli, 2003; Ito & Brotheridge, 2012; Schmidt & Diestal, 2012; Van den Broeck, De Cuyper, De Witte, & Vansteenkiste, 2010). Research has supported the spillover of job strain into non-work domains, such as family (Delaney, Grube, Greiner, Fisher, & Ragland, 2002; Edwards, Cockerton, & Guppy, 2007; Leiter & Durup, 1996; Thompson, Kirk, & Brown, 2005). It is logical to expect that job strain can spill over into the transition between work and home, however research has yet to examine the spillover of job strain into the commute.

There is evidence that suggests that job strain significantly contributes to one's safety behaviors on the job, such that greater experiences of job strain negatively impacts safety violations (unsafe behaviors) on the job, workplace incidents and accidents, and driving accidents (for professional drivers) while on the job (Hansez & Chmiel, 2010; Kotzé & Steyn, 2013; Nahrgang, Morgeson, & Hofmann, 2011). Extending spillover theory to the commute, it is not unreasonable to expect that strain from the stresses of the job may spillover into one's commute thus impacting one's safety behaviors during the commute. Specifically, I propose the following hypothesis:

H2: End-of-day job strain will be positively associated with frequency of commuting lapses, errors, and violations.

The Dual Roles of Rumination

The concept of rumination grew primarily out of the clinical literature due to its associations with negative psychological states (i.e., depression and anxiety). Rumination is defined as “a class of conscious thoughts that revolve around a common instrumental theme and that recur in the absence of immediate environmental demands requiring the thoughts” (Martin & Tesser, 1996, p. 7). Martin and Tesser (1996) suggest that rumination covers a wide range of perseverative thinking, which is characterized by its frequency, involvement of automatic and controlled processes, and hindrance of goal attainment. This suggests that in order for perseverative thinking to be considered rumination, it must occur frequently, either as a conscious or unconscious process, and must be viewed as impeding an individual's wants and needs.

Research examining rumination in the work context has increased over the last decade. Work-related rumination involves intrusive, repetitive thoughts directed at work-related issues (Cropley & Zijlstra, 2011).Work-related rumination has been linked to various negative outcomes, such as: increased risk for cardiovascular disease (Kivimäki et al., 2006), negative mood (Pravettoni, Cropley, Leotta, & Bagnara, 2007), salivary corticol secretions (Rydstedt, Cropley, Devereux, & Michalianou, 2009), unhealthy eating behaviors (Cropley, Michalianou, Pravettoni, & Millward, 2012), and poor sleep or sleep disturbances (Ǻkerstedt, Nordin, Alfredsson, Westerholm, & Kecklund, 2012).

Some scholars have conceptualized rumination as a maladaptive coping mechanism (Papageorgiou & Wells, 2004; Thomsen et al., 2004). However, some have posited that the ways in which people ruminate may sometimes help, rather than hinder. Similar to the emotion-based and problem-based coping responses put forth by Lazarus and Folkman (1984), Cropley and Zijlstra (2011) maintain that work-related rumination is comprised of two dimensions that they call affective rumination and problem-solving pondering; the absence of rumination is referred to as detachment. Affective rumination is an emotion-focused cognitive state in which thoughts about work are intrusive, pervasive, recurrent, and negative (Cropley & Zijlstra, 2011). On the other hand, problem-solving pondering is a cognitive state in which one engages in prolonged mental analysis of problems or previous work in order to devise ways in which the problem or previous work can be improved; it does not involve the emotional process that is central to affective rumination (Cropley & Zijlstra, 2011).

Work-related rumination is important to study within the context of the work domain because it can significantly impair one's ability to disengage from the work context and engage in recovery that is necessary to restore one's energetic resources. In comparison of the two hypothesized forms of rumination, Cropley, Michalianou, Pravettoni, and Millward (2009) found that those who engage in affective rumination eat more unhealthy foods than those who engage in problem-solving pondering. Further, Querstet and Cropley (2012) found that those who engage in affective rumination experienced significantly worse acute and chronic work-related fatigue compared to those who engage in problem-solving pondering, suggesting that affective rumination is more detrimental to recovery than problem-solving pondering. Little research has been conducted on the possible benefits of engaging in problem-focused pondering rather than affective rumination.

Nolen-Hoeksema (1991) suggested that rumination may occur as a reaction to experiencing stressful situations. Robinson and Alloy (2003) developed the concept of stress-reactive rumination (SRR), which posits that the propensity to engage in rumination can change depending on the nature of the stressful experience. As a cognitive activity in which individuals engage, rumination can occur before, during, or after work. If one is experiencing job strain, which can create a sense of emotional, physical, or cognitive exhaustion, they may be more likely to ruminate about their negative experiences. Thus I propose the following hypothesis:

H3: End-of-day job strain will be positively associated with work-related affective rumination during the commute home.

Because commuting constitutes a transition period between the work and home domains, ruminating while commuting may be especially detrimental. When one commutes, they must focus their cognitive resources, such as attention, on their actions as well as the actions of those that surround them, in addition to the commuting environment, weather, and road conditions. Research suggests that those who engage in rumination may not be able to adequately switch their attention from what is going on internally (e.g., repetitive thoughts) to what is going on externally (e.g., practicing safe commuting behaviors) (Joorman, Yeun, & Zetsche, 2007; Koster, De Lissnyder, De Raedt, 2013; Leung, Lee, Yip, Li, & Wong, 2009; Whitmer & Gotlib, 2013). Rumination as a cognitive activity, may impair one's ability to focus cognitive resources on the commuting task and task-relevant aspects of their surroundings. It follows then that affective rumination as response to job strain while commuting has the potential to impact safety behaviors while commuting. In other words, affective rumination may serve as the stress-reactive mechanism through which job strain affects one's safety behaviors during the commute. Thus I propose the following hypothesis:

H4: Work-related affective rumination will mediate the relationship between end-of-day job strain and risky commuting safety behaviors.

Further, ruminating during a difficult commute may be more detrimental than ruminating during an easy commute. Rumination during a difficult commute may produce levels of distraction that interfere with safe vehicle operating behaviors. Research has shown that distraction while driving results in impairment in driving performance (Chan & Singhal, 2013; Engström, Johansson, & Östlund, 2005; Young, Salmon, & Cornellisen, 2013), and a higher probability of being involved in an accident (Bakiri et al., 2013). Past research has often focused on distracting task activities or distractions induced in simulated tasks (Bakiri et al., 2013; Young et al., 2013). However cognitive activities that emanate from what is going on at work may also be distracting, thus affecting one's safety behaviors. These cognitive distractions could be negative (i.e., work-related affective rumination) or positive (i.e., work-related problem-solving pondering). Thus, I propose the following hypothesis:

H5: Work-related rumination will moderate the direct effect of commuting stress on risky commuting safety behaviors, such that the positive relationship between commuting stress and risky commuting safety behaviors is stronger when one is also engaging in work-related rumination.

Furthermore, other forms of work-related rumination may also take place during the commute. However, it is not clear whether such "positive rumination" would function in the same way as affective rumination. It could serve to mitigate job strain and its associated consequences; alternatively, like affective rumination, it may simply serve as another non-task-related drain on cognitive resources during the commute. Research on work-related problem-solving pondering is still very sparse, so there is little guidance from the empirical literature. Due to the paucity of research examining the effects of problem-solving pondering, or positive rumination, on potential psychosocial and safety outcomes, I propose the following research question:

Research Question 1: What is the relationship of work-related problem-solving pondering with risky commuting safety behaviors?

Daily Fluctuations of Commuting and Job Experiences

Much of the previous research regarding commuting experiences and commuting stress has relied on cross-sectional or multi-wave designs (approximately 2 or 3 time points), but this may limit the ability to adequately capture the dynamics of commuting stress. Given the time-varying nature of commuting experiences and commuting stress, there is a need to examine these variables on a daily level.

While there may be stable components to job strain, the experience of job strain can also fluctuate on a daily basis. There is evidence that suggests that job demands can have an immediate effect on job strain, and that this can fluctuate from day to day (Ilies, Johnson, Judge, & Keeney, 2011). Like job strain, work-related rumination can also fluctuate daily. Researchers that study dynamic events advocate for the need to study such events at the level of the phenomenon (e.g., through daily diary methodology). A few studies have utilized daily diary (DD) methodology when examining rumination. For example, Genet and Seimer (2012) found evidence of significant within-person variation in daily levels of rumination, and that greater instances of daily rumination moderated the relationship between unpleasant daily events and negative mood, but found no such moderating effects when rumination was low. Nolen-Hoeksema (1993) found that daily rumination was related to more depressed mood.

In addition to capturing the daily variance in experiences that fluctuate on a daily basis, using a DD approach reduces bias and error that is characteristic in retrospective reporting of experiences, and provides a much clearer picture of the relationships of interest. Daily diary methods involve end-of-day sampling of participants for a predetermined time (e.g., 5 days). Thus, for the present study the commute from work to home (for which details of the commute experience will be fairly fresh in memory) was selected for examination using daily diary methodology.

Method

Participants

Using Amazon's Mechanical Turk (MTurk), a heterogenous sample of 189 participants (selected from an initial group of 511 individuals who completed a screening survey) were invited to participate in a daily diary study on work and commuting experiences. Only U.S. citizens with a 95% approval rate, who had previously completed 50 or more tasks, were invited to participate in the study. In addition, only respondents who were employed full-time (35 or more hours per week) and only those commuting via private vehicle were selected for inclusion in the current study, as past research has shown that commuting stress differs by commuting mode (Wener & Evans, 2011). Two validation questions were embedded to ensure effortful responding. No participants failed to respond correctly to both of the validation questions. In all, 511 participants completed a screening survey, of which 189 met the study criteria for eligibility.

Of the 189 who were sent a baseline survey, 140 participants completed it (response rate = 74%). Of the 140 participants who completed the baseline survey, 131 completed seven or more daily surveys (response rate = 93.6%), and 95 completed all 10 daily surveys (response rate = 67.9%). Of the 131 who completed seven or more daily surveys, 26 were excluded for one of three reasons. Although the screening survey asked participants whether they worked full-time or not, three participants were excluded from further analyses due to their response of working less than 35 hours per week on average in the baseline survey. Two participants were excluded because they responded that they work only four days per week on average, rather than five. Furthermore, 21 participants were excluded for responding that they work a shift other than a regular day-time shift. Thus, of the 140 participants that completed the baseline survey, 106 were included in analyses (response rate = 76%).

The majority of participants were white (82%), male (62%), and highly educated, with 65% reporting having obtained a four-year college degree or higher. Mean age was 34.6 years, with approximately 51% of participants married or living with a partner and 39.6% single. Participants were employed in a wide variety of jobs, including: professional (23.6%), management/business/financial (24.5%), and office administrative (16%). The average time employed with their company was 6.1 years, with 22% of the sample reporting a tenure of 10 to 30 years.

Measures

All measures used were originally developed for cross-sectional research and are based on previously validated scales with Likert-type response formats. These scales were adapted to fit a daily diary methodology, and unless otherwise specified, the adapted response format utilized a binary yes/no response scale. Measures were piloted in order to streamline both number of items and response options, so as to create a manageable task for participants. All items and measures can be found in Appendix A.

C*ommuting stress.*

Stress on the commute home (CS) was assessed via subjective reactions to the commute (Folkman & Lazarus, 1985; Koslowsky & Krausz, 1993; Morrow & Barnes-Farrell, 2008; Stanton, Balzer, Smith, Parra, & Ironson, 2001), predictability (Evans et al., 2002), control (Evans et al., 2002), and impedance (Kluger, 1998) adapted for daily use.

Subjective reactions to the commute was assessed using 10 items describing emotions indicative of stress one might feel while commuting on a daily basis (Folkman & Lazarus, 1985; Koslowsky & Krausz, 1993; Morrow & Barnes-Farrell, 2008; Stanton et al., 2001). Items were derived from a larger 15-item scale that was utilized as a measure of commuting stress in previous thesis and dissertation work on the topic (Alton, 2006; Morrow, 2010). Example items include: “anxious,” “annoyed,” and “irritated.” Items included the stem, “Today during my evening commute, I felt…” Items were coded such that higher scores indicated a greater degree of subjective commuting stress. Reliability was assessed via the Kuder Richardson-20 (KR-20). Reliabilities ranged from .85 - .91 across the 10 days of data collection.

Predictability of the commute was assessed using two items from Evans et al. (2002) four-item scale. An example item is, “I knew how long my commute home was going to take.” Items were coded such that higher scores indicated less predictability. The stem was adapted in order to reflect daily occurrences. Reliability was assessed via the KR-20. Reliabilities for predictability ranged from .81 - .96 across the 10 days of data collection.

Control of the commute was assessed using two items from Evans et al. (2002) three-item scale. An example item is, “I could control how long it took me to get home.” Items were coded such that higher scores indicated less control over the commute. The stem was adapted in order to reflect daily occurrences. Reliability was assessed via the KR-20. Reliabilities for control ranged from .66 - .83 across the 10 days of data collection.

Impedance was assessed via distance (e.g., "How much time (in minutes) did it take you to commute from work to home today?") of the commute and duration (e.g., "How many miles was your commute from work to home today?") of the commute. An index similar to Kluger (1998) was calculated for each participant, whereby distance (miles) and duration (minutes) were standardized and then averaged to create a single measure of impedance. For each item, the word "today" was added in order to reflect daily occurrence.

Work-Related Rumination.

The Work-Related Rumination Questionnaire (WRRQ; Cropley, Michalianou, Pravettoni, & Millward, 2012) was adapted for use to the (daily) commute from work. The WRRQ is composed of three subscales measuring affective rumination (AR), problem-solving pondering (PSP), and detachment (DET) that comprise five items each. During piloting, items from each subscale with a factor loading of less than .40 were eliminated from the full DD survey, leaving three subscales comprised of four items each, for a total of 12 items. An example item for affective rumination is, "I became tense when I thought about work related issues"; an example item for problem-solving pondering is, "I thought of how I can improve my work-related performance". The detachment subscale was not utilized in substantive analyses. All items included the stem, "Today during my commute from work". Items were coded such that higher scores indicated a greater degree of affective rumination and problem-solving pondering, respectively. Reliability was assessed via the KR-20. Reliabilities for AR ranged from .83 - .91 across the 10 days of data collection. Reliabilities for PSP ranged from .57 - .82 across the 10 days of data collection.

Job Strain.

Job strain (JS) was assessed via items measuring emotional strain (Demerouti, Bakker, Vardakou, & Kantas, 2003), cognitive strain (Chalder et al., 1993), and subjective response to work (Stanton et al., 2001), adapted for daily use. Items were rephrased to fit the post-commute/post-work daily survey.

Emotional strain was assessed using three items (example, “Today at work, I felt emotionally drained”) from the emotional exhaustion subscale (seven items) of the Oldenburg Burnout Inventory (OLBI; Demerouti et al., 2003). Items were coded such that higher scores indicated a greater degree of emotional strain. The stem was altered in order to capture daily occurrence. Reliability was assessed via the KR-20. Reliabilities for emotional strain ranged from .76 - .86 across the 10 days of data collection.

Cognitive strain was assessed using four items (example, “Today at work, I had difficulty concentrating”) from the six-item mental fatigue subscale of the Fatigue scale (Chalder et al., 1993). An example item is, “I had difficulty concentrating.” The stem was altered such that participants were asked to think about their work experience that particular day. One item, “How was your memory?” did not adapt well to capturing daily occurrence of cognitive strain and was therefore not used. Items were coded such that higher scores indicated a greater degree of cognitive strain. Reliability was assessed via the KR-20. Reliabilities for cognitive strain ranged from .71 - .82 across the 10 days of data collection.

Subjective response to work was assessed using nine items (example, “Today, my work was demanding”) from the 15-item Job Stress in General Scale (Stanton et al., 2001). The stem was altered such that participants were asked to indicate if they felt any of the following during their workday. Items were coded such that higher numbers indicated a greater degree of stress

Reliability was assessed via the KR-20. Reliabilities for job stress ranged from .87 - .91 across the 10 days of data collection.

Commuting safety behaviors.

Commuting safety behaviors (CSB) were assessed with 14 items from the 24-item Driver Behavior Questionnaire (DBQ; Parker, Reason, Manstead, & Stradling, 1995) adapted for daily use. The DBQ assesses driver violations, errors, and lapses. Five items were used to assess violations (example, "This evening I drove faster than the speed limit"); four items were used to assess errors (example, "This evening I failed to check my rear-view mirror before changing lanes"); and five items were used to assess lapses (example, "This evening I hit something when reversing that I hadn't previously seen"). Based on piloting, items chosen for this scale were appropriate for assessing safety behaviors on a daily basis. A stem was included (i.e., "This evening,") in order to reflect daily occurrence. Because the items captured inherently different behaviors (i.e., going over the speed limit is qualitatively different from becoming impatient with a slow driver), reliabilities were not calculated for these scales.

Commute demographics.

Commuting demographics for the daily survey included travel speed disruptions. Travel speed disruptions (TSD) were assessed via five items adapted for DD use from Novaco et al. (1990). Participants were asked to indicate whether they experienced disruptions such as heavy traffic on a daily basis.

Participant Demographics.

Participant personal and job information was collected during a baseline survey, completed approximately one week prior to daily diary collection. Variables collected included: age, gender, race, education, occupation, marital status, job control (JC), and work schedule control (SC). These variables were measured in order to describe the sample and examine their use as potential control variables.

Controls.

Participant demographic variables (e.g., age, gender, SC, JC) were examined for their possible use as covariates at level 2 (between-person level) in the model. Zero-order correlational analyses indicated that SC and JC should be included in the models as covariates at level 2 due to their significant correlations with the research variables of interest across the ten days of daily diaries. Additionally, the possible covariate of TSD was examined for use as a level 1 (within-person level) control. Zero-order correlational analysis indicated that TSD should be included in the models as a level 1 control due to significant correlations with the research variables of interest across the ten days of daily diaries.

As such, the current study controlled for participants' SC and JC at level 2, and TSD at level 1.

Procedure

Participants were recruited via MTurk. Evidence suggests that the nature of the sample supplied from MTurk is better and more representative of the adult population at large over convenience samples or those recruited from university participant pools (Paolacci, Chandler, & Ipeirotis, 2010). As described earlier, participants were screened in order to ensure that they fit the study criteria for participating. All individuals who completed the screening survey for participation in the study were given $0.20 and those who met the eligibility criteria were invited to take a baseline survey. Email invitations to complete the baseline survey were sent to eligible participants following the screening process with an online link to the baseline survey. The baseline survey was used to collect participant personal, job-related, and commuting-related demographics. Surveys were linked via participants' MTurk employee ID number, which was requested on all surveys. For completing the baseline survey, participants were given $4.

Participants who completed the baseline survey were invited to participate in the daily diary study. Approximately one week after completing the baseline survey, participants began filling out once-daily surveys utilizing daily diary methodology after arriving home from their evening commute from work. Daily surveys were collected for 2 working weeks (10 business days). Email reminders containing links to the survey were sent to participants twice a day (one sent mid-day to remind them of their needed survey response upon arriving home and one sent at 6pm to remind participants who hadn't filled out the daily survey by then to please do so). Participants were paid $2 per daily survey completed, plus a bonus of $5 for completing all 10 daily surveys.

Approximately one week following the end of the daily dairy data collection, a follow-up survey was sent to participants. Participants were given $5 for completing the follow-up survey. Upon completion of the study, participants who completed every survey (baseline, 10 daily surveys, and follow-up survey) were eligible to win one of four $25 bonuses.

Results

Prior to conducting substantive analyses, preliminary analyses were conducted in order to examine the data for any patterns of missingness. No patterns of missing data were noted and the data were assumed to be missing at random (MAR). Further, t-tests were conducted in order to determine if significant differences existed for those participants who completed fewer than 10 daily surveys versus those who completed all 10 daily surveys. Results indicated no significant differences for participants on: age, race, education, marital status, occupation, or along most of the variables of interest across days. Significant differences existed for participants on the basis of gender [$t(104) = -2.31$, $p = .02$]. More men (n = 53, 80%) than women (n = 24, 60%) completed all 10 daily surveys. In addition, significant differences existed for participants on the basis of TSD on day six [$t(53) = 2.42$, $p = .02$]. Levene's test of equality of variances indicated that equal variances could not be assumed for this variable. Those who completed all daily surveys indicated more TSD than those who didn't complete all daily surveys.

Exploratory Factor Analyses

Utilizing SPSS version 20.0 (IBM Corp., 2011), I examined the factor structure of all study variables prior to carrying out any descriptive analyses. First, to determine what variables comprised commuting stress, I conducted an exploratory factory analysis (EFA) using principal axis factoring with promax rotation. Utilizing the first day of data, I entered the two items for predictability, the two items for control, the 10 items for subjective commuting stress, and the impedance index in an EFA. This yielded a three-factor solution with predictability loading on one factor, control loading on a second factor, and subjective commuting stress loading on a third factor. Impedance did not load significantly on any factor.

This process was repeated for JS; I utilized the first day of data and conducted an EFA for the three items for emotional strain, the four items for cognitive strain, and the 9 items for subjective response to work. This yielded a three-factor solution with the three items for emotional strain loading on one factor, the four items for cognitive strain loading on a second factor, and the 9 items for subjective response to work loading on a third factor. While all four cognitive strain items loaded on a single factor, the fourth item exhibited a low loading (<.40), and was dropped from substantive analyses. Additionally, one item (item 5) from the subjective response to work scale had a low factor loading (<.40) and was dropped from substantive analyses. A second subjective response to work item (item 4) loaded highly on two factors, and was dropped from substantive analyses.

I also conducted an EFA that included all items for driving violations, errors, and lapses. Due to little to no variance across the 10 days of daily diaries for errors and lapses, these items were dropped from substantive analyses. Therefore, risky CSB was represented in all substantive analyses by the driving violations subscale of the DBQ (5 items total).

Confirmatory Factor Analyses

After making the minor modifications noted above, I conducted confirmatory factor analyses (CFAs) using MPlus version 7.3.1 (Muthén & Muthén, 1998-2012) to confirm the factor structure for both CS and JS. I created an additive index for each variable by summing the number of responses. For example, predictability is measured by two items, coded 1 for ‘yes’ and 0 for ‘no’. Therefore, I summed the number of ‘yes’ responses. As such, predictability for each individual could range from 0-2. This procedure was repeated for each variable comprising JS and CS. Again, using the first day of data to confirm the factor structure yielded by the EFAs, I first examined CS using the additive index for each variable as indicators of an underlying CS latent variable. This model yielded a solution with a non-positive definite matrix caused by a negative residual variance for the control indicator. Holding the residual variance at zero for the control indicator yielded a model that fit the data well [χ^2 (1) = .03, p = .87; CFI = 1.00; TLI = 1.22]. However, the factor loadings were low (<.40), indicating that commute control, predictability, and subjective stress during the commute were not tapping the same underlying construct. It could be that both commute control and predictability behave as stressors, and subjective commute stress is the felt response to those stressors. Research suggests that what is more salient to individuals is not the stressor itself, but the felt response of stress (Lazarus &

Folkman, 1984). For this reason, I decided to model CS as subjective stress during the commute and dropped commute predictability and control from further substantive analyses.

A subsequent CFA was conducted on subjective commuting stress day one, whereby the 10 items were loaded onto an underlying latent factor, with each item being binary. Analyses were conducted utilizing weighted least square parameter estimates (WLSMV) using a diagonal weight matrix with standard errors and mean-adjusted chi-square test statistic that uses a full weight matrix. This is the most appropriate estimator given that all factor indicators were binary (taking on a value of 0 if the response to the item was 'no', and a value of 1 if the response to the item was 'yes'). The model fit was adequate [χ^2 (35) = 52.53, p = .03; RMSEA = .07; CI(90) = .02, .10; CFI = .99; TLI = .98].

The above procedure was repeated for JS, whereby I used the additive index for each variable (emotional strain, cognitive strain, and subjective response to work) as indicators of an underlying JS latent variable. The initial model fit the data poorly [χ^2 (24) = 92.88, p <.001; CFI = .85; TLI = .78], and all indicators loaded well (>.40). When the degrees of freedom (df) for the model are small in conjunction with the small sample size, the RMSEA is not reported because it frequently points to a poor fitting model when indeed the model is properly specified (Kenny, Kaniskan, & McCoach, 2014). Examination of the modification indices indicated that correlating the errors of cognitive strain across time points would lead to better model fit. This is due to the fact that constructs measured across time points may have errors correlated in subsequent time periods (Kline, 2011, p. 358). Indeed, correlating the cognitive strain errors across time points improved the model fit [χ^2 (21) = 47.07, p <.001; CFI = .95; TLI = .91].

Furthermore, previous work has validated AR and PSP as two facets of an underlying work-related rumination construct (Cropley et al., 2012). Because all factors were binary, analyses were conducted utilizing WLSMV using a diagonal weight matrix with standard errors and mean-adjusted chi-square test statistic that uses a full weight matrix. I confirmed the two-factor structure by examining the first day of data and testing a one-factor versus a two-factor model. In the one-factor model; all items for AR and PSP were loaded onto one underlying factor, while in the two factor model, the items were split and loaded onto a factor representing AR and a factor representing PSP, respectively. The one-factor model fit the data poorly [χ^2 (20) = 60.94, $p < .001$; RMSEA = .15; CI(90) = .10, .19; CFI = .97; TLI = .98]; while the two factor model yielded adequate fit [χ^2 (19) = .24.84, $p = .17$; RMSEA = .06; CI(90) = .00, .11; CFI = 1.00; TLI = 1.00].

Longitudinal Invariance Testing

Prior to testing the relationships of interest, it was necessary to determine if the study constructs were invariant over time, given that they were measured each day for 10 days. Each construct of interest (i.e., CS, AR, PSP, and JS) was examined for Configural invariance. Configural invariance estimates whether measures taken at different time points represent the same underlying construct (Ployhart & Vandenburg, 2010). Because 10 days of data are unwieldy for most computer programs, MPlus included, I chose three time-points representing the beginning, middle, and end of daily observations (days one, five, and ten) to carry out the invariance testing over time, as recommended by Múthen (2011).

CFAs were conducted with the 10 items for days one, five, and ten loading onto CS at days one, five, and ten, respectively. This process was repeated for AR, PSP, and JS. CS, AR, and PSP were composed of binary indicators, as such, in each of the Configural invariance models for these variables, the thresholds and factor loadings were free, while the scale factors were fixed at one and the factor means fixed at 0 for each time point. For JS, the composite scores for emotional strain, cognitive strain, and subjective response to work comprised the three indicators. Because JS was composed of continuous indicators, to test for Configural invariance, the intercepts, factor loadings, and residual variances were free to vary, with the factor means fixed at 0 for each time point. Standards to determine good model fit were used when appropriate (e.g., a non-significant χ^2, RMSEA <.05, CFI and TLI >.95, SRMR <.05).

For CS, the initial Configural invariance model fit adequately, indicating Configural invariance for CS. While the model chi-square was significant, the degrees of freedom were large, indicating that the significant chi-square could be driven by the size of the sample. The models for AR, PSP, and JS further indicated Configural invariance for these constructs, respectively. Results are reported in Table 1.

Descriptive Analyses

All descriptive analyses were conducting in SPSS version 20.0 (IBM Corp., 2011). The means, standard deviations, and correlations for all constructs for each day are reported in Tables 2 – 5. In order to calculate correlations, means, and standard deviations for each construct of interest, composite scores for each construct were created. All items for each construct were binary, such that each item for a given individual could take on the value of 0 (if the response to that item was no) or 1 (if the response to that item was yes). Composite scores were created for each variable for each day by summing items for each factor and creating an additive index. For example, there are three items for emotional strain. Items were coded such that higher values indicate more emotional strain. Therefore emotional strain for each individual for each day could range from 0 – 3. This procedure was repeated for each variable that composes a construct. For example, JS is comprised of emotional strain, cognitive strain, and subjective response to work. Sums were created across these variables to create an additive index. Higher scores for each composite construct indicate greater degree of that attitude/behavior (e.g., a higher score for JS indicates a greater degree of JS). All composite constructs, therefore, are summary scores.

Tests of Hypotheses and Research Question

Multilevel random coefficient modeling (MRCM) was utilized to test hypotheses and the research question due to the hierarchical nature of the data. Daily observations (level 1 N = 10,600) were nested within people (level 2 N = 106). Variables included in the models were modeled as fixed effects.

Prior to conducting analyses utilizing the computer program MPlus 7.3.1 (Muthén & Muthén, 1998-2012), an unconditional model (intercepts only) was estimated for risky CSB (driving violations) so that partitions of the total variance into variability at level 1 (day level) and level 2 (person-level) could be assessed. The unconditional model for driving violations yielded significant ICC(1) = .52 and ICC(2) = .91 values at $p < .001$, indicating that observations within subjects are not independent and warrant the utilization of MRCM. Additionally, partitioning of the variance into variability at level 1 (48%) and level 2 (52%) was done. This indicates that there is sufficient variability from both the within- and between- parts of the model to warrant examination of substantive predictors.

Moreover, because mediation is hypothesized, following recommendations put forth by Mathieu and Taylor (2007), the ICC(1) and ICC(2) values were examined for the mediator variable (AR). AR exhibited sufficient between (44%) and within (56%) person variance. Additionally, the ICC(1) = .44 and ICC(2) = .88 values were significant ($p < .001$), again indicating that observations within subjects are not independent and thus warrant MRCM.

In order to examine hypotheses one, two, three, and five, separate multilevel regression analyses were conducted in MPlus, with all variables treated as continuous. For hypothesis four, a multilevel mediation analysis was conducted. Both the control variable (TSD) and the substantive predictor variables (CS, AR, and JS) at level 1 were group- (or person) mean centered. When variables are person-mean centered, the variance in the intercept term represents the within person variance in the outcome variable. In other words, person-mean centering reflects within-person variability only (Hoffman & Gavin, 1998). For example, within person centered strain scores indicate whether individuals feel more or less strain than what they feel on average, representing daily fluctuations for that individual over time. The aggregate means for all level 1 substantive variables were modeled on the between person level, or level 2. Doing this allows the within- and between- person variances to be partitioned cleanly. By examining the within- and between- person variability, the effects of daily fluctuations and average experiences across individuals can be examined. The models tested were conditional, or random-intercepts models. Random-intercepts models indicate that there are mean-level differences between level 2 units (i.e., individuals) among the variables of interest.

It should be noted that tests of hypotheses one, two, four, and five, can only be partially supported, as the dependent variable (risky CSB) contained only driver violations rather than the hypothesized full array of driver violations, errors, and lapses comprising risky CSB. As stated previously, there was insufficient variation in the errors and lapses subscale of the DBQ, and as such they were dropped from substantive tests of hypotheses. Thus, statements of support (or non-support) for each hypothesis refer only to the driver violations subscale of risky CSB.

Hypothesis 1 stated that CS would be positively associated with risky CSB. Results indicated support for hypothesis 1 at level 1 ($\beta = .27$, $p <.001$) and at level 2 ($\gamma = .47$, $p < .001$) after controlling for level 1 TSD and level 2 SC and JC. On days when individuals experienced greater CS, they also engaged in increased risky CSB. Approximately 15% of the variance in daily risky CSB was explained by daily CS. When examining the aggregate means, or level 2 (between person effects), results indicated that on average, those who experience CS also engage in increased risky CSB, after controlling for level 2 SC and JC. Approximately 22% of the variance in average risky CSB was explained by average CS. Please see Table 6 for results.

Hypothesis 2 stated that end-of-day JS would be positively associated with risky CSB. Results indicated support for hypothesis 2 at level 1 ($\beta = .12$, $p <.001$) after controlling for level 1 TSD, and level 2 ($\gamma = .47$, $p < .001$) after controlling for level 2 SC and JC. On days when individuals experienced greater end-of-day JS, they also engaged in increased risky CSB. Approximately 6% of the variance in daily risky CSB was explained by daily end-of-day JS. At level 2, results indicated that on average, those who experience more end-of-day JS also engage in increased risky CSB. Approximately 17% of the variance in average risky CSB was explained by average end-of-day JS. Please see Table 7 for results.

Hypothesis 3 stated that end-of-day JS would be positively associated with AR. Results indicated support at level 1 ($\beta = .57$, $p <.001$) after controlling for level 1 TSD, and level 2 ($\gamma = .74$, $p < .001$) after controlling for level 2 SC and JC. On days when individuals experienced greater end-of-day JS, they also engaged in increased frequency of AR. Thirty-five percent of the variance in AR was explained by daily end-of-day JS. At level 2, results indicated that on average, those who experience more end-of-day JS also engage in greater frequency of AR. Approximately 53% of the variance in average AR was explained by average end-of-day JS. Please see Table 8 for results.

Hypothesis 4 stated that AR would mediate the relationship between end-of-day JS and risky CSB. Preacher, Zhang, and Zyphur's (2011) approach was utilized to estimate a 1-1-1 mediation in multilevel modeling via a multilevel structural equation modeling (MSEM) framework. This approach reduces the bias that results from conflation of between- and within-person effects and produces better confidence interval coverage (Preacher, Zhang, & Zyphur, 2011). Hypothesis four was supported at level 1 and level 2. After controlling for level 1 TSD, daily end-of-day JS significantly predicted daily AR ($\beta = .59$, $p <.001$), and daily AR in turn significantly predicted daily risky CSB ($\beta = .10$, $p =.003$). After accounting for the effect of daily AR on daily risky CSB, daily end-of-day JS significantly predicted risky CSB ($\beta = .06$, $p =.03$), indicating a partial mediation. On days when individuals experienced greater end-of-day JS, they also engaged in more AR and daily risky CSB. Those who engaged in more AR also engaged in more daily risky CSB. Approximately 6% of the variance in daily risky CSB is explained by daily end-of-day JS and daily AR, while approximately 35% of the variance in daily AR is explained by daily end-of-day JS.

When examining the between-person portion of the model, results indicated that, on average, those who experience greater end-of-day JS engage in greater frequency of AR ($\gamma = .73$, $p < .001$), and those who engage in greater frequency of AR also engage in increased risky CSB ($\gamma = .32$, $p = .02$). After accounting for the effect of AR on risky CSB, the path from average end-of-day JS to average risky CSB was not significant ($\gamma = .18$, $p = .22$) after controlling for level 2 SC and JC, indicating full mediation. Those who engaged in more end-of-day JS experienced more AR, on average; and those who engaged in more AR also engaged in more risky CSB. Approximately 23% of the variance in average risky CSB is explained by average AR, while approximately 53% of the variance in average AR is explained by average end-of-day JS.

The conditional indirect effect of daily end-of-day JS on daily risky CSB through daily AR (level 1; $ab = .034$, $p = .004$) was examined via the calculation of confidence intervals. The indirect effect is considered significant if the confidence interval does not contain a zero-value. The raw intervals calculated did not contain a zero-value (.015, .053) indicating the indirect effect is significant, supporting mediation. Because indirect effects are often not normally distributed, it is suggested that they be examined via Bayes Credibility Intervals (Bayes CI) when conducting multilevel modeling (Bauer, Preacher, & Gil, 2006). Bayes CI at the 5^{th} and 95^{th} percentile indicated (.008, .055) further support for the significance of the indirect effect, indicating that the data support the role of daily AR as a level 1 mediator between daily end-of-day JS and daily risky CSB.

This procedure was repeated for the indirect effect in the between-persons model. The conditional indirect effect of mean-level end-of-day JS on average risky CSB through mean-level AR (level 2; *ab* = .095, *p* = .03) was examined via the calculation of confidence intervals. The raw intervals calculated did not contain a zero-value (.025, .164) indicating the indirect effect is significant, supporting mediation. The Bayes CI was also calculated; Bayes CI at the 5^{th} and 95^{th} percentile indicated (.023, .157) further support for the significance of the indirect effect. In summary, the data support the role of average AR as a level 2 mediator between average end-of-day JS and average risky CSB. Please see Table 9 for results.

Prior to examining the moderating effect proposed in hypothesis 5 between CS and work-related rumination, the CS, AR, and PSP variables at level 1 were person-mean centered and interaction terms were created, such that there was one interaction term for CS and AR, and one interaction term for CS and PSP. As with previous analyses, TSD was also person-mean centered. At level 2, interaction terms were created for mean-level CS, AR, and PSP, respectively. SC and JC at level 2 were grand-mean centered. In order to examine hypothesis five, a multilevel regression was conducted in which the control variables were regressed onto risky CSB at level 1 and level 2. In addition, CS, AR, and PSP, and their respective interaction terms were also regressed on risky CSB at level 1; with the mean-level of these variables and their interaction terms regressed on mean level risky CSB at level 2. Results indicate partial support for hypothesis five at level 1; at level 1 there was an interaction between daily CS and daily AR (β = .11, p =.03), but not for daily CS and daily PSP (β = -.03, p =.51). However, at level 2, there was no interaction between CS and AR on risky CSB (γ = -.35, p = .32); likewise there was no interaction between CS and PSP on risky CSB (γ = -.05, p = .87) at level 2. Please see Table 10 for results.

In order to understand the nature of the interaction, I utilized Preacher, Curran, & Bauer's (2006) tool for calculating the simple slopes for 2-way interactions with multilevel modeling. Results indicate that the slopes are significant at both the mean of daily AR (z = 3.03, p = .003), and one standard deviation above the mean (z = 2.58, p = .01). Figure 2 displays a plot of the interaction.

To examine research question 1 regarding the relationship between PSP and risky CSB, a multilevel regression analysis was conducted, regressing daily risky CSB on daily PSP at level 1, and the aggregate means of these variables at level 2. Results indicate that daily PSP does not predict daily risky CSB (β = .05, p =.09) at level 1 after controlling for level 1 TSD. However, at level 2 results indicated that on average, those who engage in greater frequency of PSP also engage in increased risky CSB (γ = .40, p <.001), after controlling for level 2 SC and JC. Approximately 17% of the variance in average risky CSB was accounted for by average PSP. Please see Table 11 for results.

Supplemental Analyses

Although not hypothesized, I conducted additional analyses to determine if PSP mediated the relationship between JS and risky CSB, in the same fashion as its counterpart, AR. Because PSP had no relationship with risky CSB at level 1, which can be seen by examining the results for research question 1, I did not specify a mediation at level 1. Utilizing Preacher et al.'s (2011) approach for conducting multilevel mediation, I utilized the aggregate means of JS, PSP, and risky CSB at level 2. At level 2, results indicated a partial mediation. On average, those who experienced more JS engaged in greater frequency of PSP ($\gamma = .22$, $p < .001$), and engaged in increased risky CSB ($\gamma = .34$, $p = .002$). Further, on average, those who engaged in greater frequency of PSP also engaged in increased risky CSB ($\gamma = .32$, $p < .001$). The indirect effect for level 2 ($ab = .028$, $p = .01$) indicates support for partial mediation. Following the procedure laid out above, Bayes CI were estimated; the Bayes CI (.005, .050) did not contain a zero-value lending further support for partial mediation of average JS on average risky CSB through average PSP. Please see Table 12 for results.

Further, I sought to examine whether daily variability in commute time and distance impacted risky CSB. Along with previous, hypothesized relationships, I person-mean centered all level 1 variables and added the aggregate means of those variables in at level 2. Results indicated no support for the potential impact of daily commute time ($\beta = .01$, $p = .75$) and distance at level 1 ($\beta = .02$, $p = .23$) on risky CSB after controlling for level 1 TSD. Results also indicated no support for the potential impact of average commute time ($\gamma = .03$, $p = .88$) and distance ($\gamma = .26$, $p = .09$) on average risky CSB after controlling for level 2 SC and JC. Please see Table 13 for results.

In addition, I tested a full path model, whereby daily JS leads to risky CSB through the mediating pathway of daily AR; daily CS also leads directly to daily risky CSB with daily AR moderating the relationship between daily CS and daily risky CSB. Please see Figure 3 for the tested path model at level 1. Again, all level 1 variables were person-mean centered so as to only reflect daily fluctuations within individuals. The aggregate means of these variables were examined in the between-portion of the model, or level 2. Because prior testing revealed that there was no moderation for the aggregate mean of AR on the path from average CS to average risky CSB, this path was not included in the between-persons portion of the model. Please see Figure 3 for the tested path model at level 2. Results indicated that for the level 1 portion of the model, daily JS significantly predicted daily AR ($\beta = .60$, $p < .001$); however, daily AR did not significantly predict increased daily risky CSB ($\beta = .02$, $p = .67$). Further, there was no significant path from daily JS to daily risky CSB ($\beta = .02$, $p = .45$). Daily CS significantly predicted daily risky CSB ($\beta = .14$, $p < .001$), with daily AR moderating the path from daily CS to daily risky CSB ($\beta = .09$, $p = .046$).

At level 2, average JS significantly predicted average AR ($\gamma = .73$, $p < .001$), however, the paths from average AR to average risky CSB was not significant ($\gamma = .22$, $p = .20$), nor were the paths from average JS to average risky CSB ($\gamma = .01$, $p = .94$) or average CS to average risky CSB ($\gamma = .32$, $p = .13$). Please see Figure 4 and Table 14 for results.

Discussion

This study sought to examine the impact of commuting stress, job strain, and work-related rumination on risky commuting safety behaviors utilizing daily diary methodology in order to examine the dynamic nature of these relationships. Using a daily diary approach, and obtaining data from full-time employees who commute to and from work on a daily basis, I explored the impact that daily job strain can have on one’s commuting safety behaviors through the explanatory mechanism of work-related rumination; further, I explored the impact that commuting stress can have on risky commuting safety behaviors. While past research has sought to determine the spillover between work and home domains and the potential impact that commuting stress can have on one's home and work life, much of this past research has examined the more distal outcomes in each domain, rather than focusing on what may be more proximal, the safety of the employee while they are involved in both the physical and psychological transition between work and home (i.e., commuting). Results indicate at least partial support for all five hypotheses (with the caveat that the outcome for which all hypotheses were tested was necessarily limited to the driver violations facet of risky CSB).

At both level 1 (daily) and level 2 (between persons), results support the notion that commuting stress and job strain impact risky commuting safety behaviors. At level 1, this indicated that on days when individuals experience more commuting stress and end-of-day job strain, they engaged in greater frequency of risky commuting safety behaviors. At level 2, this indicates that on average, individuals who experienced more commuting stress and end-of-day job strain also engaged in greater frequency of risky commuting safety behaviors. In addition, results support partial mediation of affective rumination on the relationship between end-of-day job strain and risky commuting safety behaviors at level 1, and full mediation at level 2.

Further, findings suggest that within-individuals, affective rumination serves to exacerbate the effect of commuting stress on risky commuting safety behaviors. The propensity to engage in greater frequency of risky commuting safety behaviors is greater on days when individuals are experiencing more commuting stress and also engaging in affective rumination about work. These results indicate that on days when individuals are experiencing a more difficult commute, engaging in affective rumination can be particularly deleterious. However, this effect was not found between individuals. This could indicate that the level 2 sample size (n

= 106) was not large enough to detect a moderating effect for this relationship of interest, not that the relationship doesn't exist. Taken together, these results support the impact that daily stressful commuting experiences can have on individuals' safety, as well as the detrimental impact that negative spillover from work can have on one's safety when transitioning from work to home.

Results from the current study also highlight the notion that while problem-solving pondering is considered positive, on average, when individuals engage in problem-solving pondering, they also engage in increased risky safety behaviors while commuting. However, this effect was not supported at level 1. Exploration of the potential mediating effects of problem-solving pondering on the relationship between end-of-day job strain and risky commuting safety behaviors across individuals echoed the above findings. Across individuals, there was evidence for a partial mediation. This indicates that on average, when individuals engage in problem-solving pondering, this serves as a partial explanatory mechanism through which job strain spills over into the commute home and impact's individuals' safety behaviors during the commute.

The discrepancy in these findings between affective rumination versus problem-solving pondering could indicate that individuals engage in less problem-solving pondering than affective rumination, so the ability to find a within-individual effect of problem-solving pondering was limited. Indeed, while the overall mean of affective rumination was lower than that of problem-solving pondering across the majority of the days of data collection, the standard deviation was much higher indicating more variability within individuals in the experience of affective rumination over problem-solving pondering. This indicates that individuals may be more prone to engaging in negative, repetitive thoughts about their work experiences, over positive, repetitive thoughts about their work experiences and how to solve problems that arise at work. Indeed, one explanation is that if individuals are experiencing job strain, this may be priming them to think more negatively, rather than positively, thus increasing the tendency to engage in more negative (e.g., affective) rumination about their work experiences, rather than positive (e.g., problem-solving pondering). This view is supported by the notion that individuals are more sensitive to negative information, and this negativity bias results in individuals' increased tendency to experience more negative physiological, cognitive, emotional, and social outcomes (Taylor, 1991). However, across individuals, results suggest that it doesn't matter what type of rumination you're engaging in, whether it be positive or negative, the rumination may still be acting as a distraction impairing one's safety during the commute.

Previous research has found that both the duration spent commuting and the distance of the commute can impact both work and home outcomes (Novaco et al., 1979; Novaco & Collier, 1994). As such, I conducted ancillary analyses to investigate whether the time spent commuting and the distance of the commute had any bearing on engaging in risky commuting safety behaviors. Findings suggest that on days when individuals spend more time commuting and/or commute longer distances, they do not necessarily engage in greater frequency of risky commuting safety behaviors. These results were echoed across individuals, on average, those who spent longer time commuting and commuted greater distances were not more likely to engage in increased risky commuting safety behaviors.

Although not hypothesized, I tested a full path model at both the within- and between-person levels. While findings suggest at level 1 that daily end-of-day job strain leads to increased daily affective rumination, and that experiencing more affective rumination moderates the relationship between commuting stress and risky commuting safety behaviors, results should be interpreted cautiously. First, the fit of the model was poor, indicating potential model misspecification at both the within- and between- levels. However, it should be noted that parsing out model fit at both the within- and between- levels is problematic, as the model fit of level 2 (the between level) is largely driven by the sample size and fit at level 1. As such, the fit of the model examined may not accurately reflect the model specified. Additionally, when examining the full path model at level 1, there was no mediation of affective rumination on the relationship between daily end-of-day job strain and risky commuting safety behaviors. Further, many of the paths at level 2 were non-significant, the only relationship that held at level 2 was that on average, end-of-day job strain had a strong relationship with affective rumination. Indeed examination of the path coefficients at level 1 and level 2 indicate that the effects of job strain on affective rumination were strong at both levels; it could be that these effects consumed the greater part of the variance in the model, leaving it difficult to detect more significant effects. Although interesting findings were uncovered via the supplemental analyses, I hesitate to draw conclusions given that hypotheses were not specified a priori.

Theoretically, findings suggest that commuting stress works to actively deplete one's resources, which are especially important given that these resources should be utilized to pay attention to the external environment, to minimize the potential, serious negative implications of engaging in risky safety behaviors while commuting. Further, findings support the hypothesis that work can have an impact on one's safety ***outside*** the workplace, through the spillover of job strain and rumination about one's job environment and experiences.

Strengths and Limitations

The current study has a number of important strengths, including collecting data on stress, strain, work experiences, and risky commuting safety behaviors as they occurred, which minimizes retrospective bias and error that can occur at the interindividual level. Additionally, the time commitment for a daily diary study is much shorter than standard longitudinal methods.

However, as with any study, the current one is not without its limitations. First, I did not assess other potential distracting mechanisms that may impact one's daily commuting safety behaviors. Examining other potential distracting mechanisms that emanate from one's job while commuting (e.g., cell phone use) could provide insight as to the potential seriousness that work can have on one's safety ***outside*** of work. In addition, all constructs were measured during each survey, making the ability to support causal inference difficult due to the lack of temporal separation. Temporal separation of constructs is necessary for determining the directionality of the relationships hypothesized. Because all constructs were assessed simultaneously, the relationships could be inflated due to method effects (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003). However, examination of the correlations between variables across days indicates different patterns of significance and varying degrees of significance, indicating support for little to no method effect. Because I asked participants to respond to questions on daily job strain, commuting stress, work-related rumination, and commuting safety behaviors, this could have acted as a priming mechanism, making participants more aware of their work and commuting experiences and taking the necessary precautions.

Further, I utilized dichotomous yes/no responses for many of my variables of interest, simply asking participants if they experienced an attitude or behavior on that given day. Assessing their responses on Likert-type continuous scales might provide more sensitive assessments of the relations of interest in this study.

Additionally, there was no variability in the measures of driving errors and lapses, limiting the examination of risky commuting safety behaviors to driving violations only. This is an important consideration given that errors and lapses may also lead to deleterious commuting experiences.

Moreover, my sample lacked diversity in both race and gender, which is not representative of the U.S. population at large. Because the sample was small at the individual level (n = 106), and primarily male, potential gender differences in the relationships of interest could not be examined. It could be that due to familial responsibilities, women experience more time-pressure during the commute from work-to-home, thus perhaps experiencing more commuting stress and as a result, engaging in riskier safety behaviors during the commute. Unfortunately, neither time pressure nor familial responsibilities were measured during this daily diary study. Research has yet to explore gender differences in risky commuting safety behaviors, indicating an area ripe for future research.

Last, but not least, because the data were self-report, there is the potential that participants were not entirely truthful, potentially impacting the validity of the study.

Future Research and Practical Implications

Given the limitations of the current study, future research should seek to determine the temporal ordering of constructs in order to better determine directionality. This could be done through the utilization of a lagged design, whereby information about the mediating relationships is collected in a temporal sequence.

Further, future research should seek to examine other potential proximal outcomes of the impact of commuting stress and negative spillover of work experiences into the work and home domains, as the current study examined only one proximal outcome, safety behaviors during the commute. One such proximal home domain variable that could be examined is need for recovery. For example, does utilizing the transition time between work and home to ruminate on one's work experiences serve as a buffering mechanism between the spillover of daily job strain on recovery at home? Given the above findings, ruminating during the commute may be distracting, and as such may have deleterious consequences for employees while commuting. However, research has suggested that experiencing high workload can spillover into recovery time at home, leaving employees unable to relax and detach from work while in their home domains (Sonnentag & Bayer, 2005). What is the trade-off? This should be explored further.

In addition, job strain is but one workplace attitude that may impact employees outside the work domain on a daily basis, there are a multitude of others that may spillover into non-work domains. For example, if employees work in an environment that is negative and supportive of uncivil behaviors, do employees then carry the negative affect that they experience throughout the workday home? What are the implications of this? There is a need to examine such spillover of attitudes and behaviors on a daily basis in order to understand the dynamics of these phenomenon. Indeed, it has been theorized that work events have the potential to invoke emotional reactions that can influence subsequent employee attitudes and behaviors (affective events theory; Weiss & Cropanzano, 1996). How does experiencing these work events impact employees in their non-work domains? These and other questions are yet to be explored.

As a practical implication, this study points to the impact that daily job experiences can have on one’s safety during their commute. Thus, organizations should seek to limit the negative impact of daily job experiences. This can be done in a number of ways. One such method to limit this impact is to let employees engage in job crafting. It could be that aspects of the job that employees do create certain amounts of stress and strain, and this strain could be leading employees to engage in repetitive thoughts about their jobs and work environments during the commute home from work. Through job crafting, perhaps employees could create processes that limit the stress and strain built up from daily work tasks that may lead to either negative or positive repetitive thoughts that are acting as distracting mechanisms during the commute and impacting employees' safety outside the workplace.

The determination that job strain and work-related rumination spillover to impact the commute home for individuals is the first step in being able to design intervention efforts to reduce the potential job strain and work-related rumination for employees in hopes of improving their safety behaviors while commuting. One such intervention that may show promise is positive reflection. For instance, Bono, Glomb, Shen, Kim and Koch (2013) found that engaging in positive reflection of daily experiences at work led to reduced stress and improved health. If employees were given the opportunity to positively reflect on their workday prior to leaving their places of employment, would this lead to reduction of rumination on the commute home, and subsequent improved safety behaviors during the commute? Additionally, Nägel and Sonnentag (2013) note that opportunities for recovery are important. Organizations should seek to provide employees with more programmed recovery time from daily stresses and strains at the end of the workday, in hopes of limiting this spillover into the commute.

Conclusion

This thesis examined the impact that daily work experiences can have on employees' safety outside the workplace. In utilizing a daily diary approach to examine these experiences, findings suggested that on days when employees experience more end-of-day job strain, this spills over to affect employees' safety behaviors while commuting through the experience of rumination about work. Further, rumination about work works to exacerbate the impact that an already stressful commute has on employees' commuting safety behaviors. This thesis adds to the previous literature suggesting that work experiences can spill over to non-work domains, and does so by examining these phenomena as they occur. Understanding how work attitudes, behaviors, and experiences impact employees both in and outside the workplace is necessary to our understanding and being able to assist organizations in helping their employees lead healthier, safer lives.

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Glossary

AR: work-related affective rumination

CS: commuting stress

CSB: commuting safety behaviors

DBQ: driver behavior questionnaire

JC: job control

JS: job strain

PSP: work-related problem-solving pondering

SC: work schedule control

TSD: travel speed disruptions

Table 1. Configural Invariance Testing for Constructs

Model	χ^2	df	*p* -value	CFI	TLI	RMSEA	CI	SRMR
CS	536.96	402	<.001	0.95	0.94	0.06	.04, .07	xxx
AR	66.1	51	0.08	0.99	0.99	0.05	.00, .09	xxx
PSP	65.33	51	0.09	0.95	0.93	0.05	.00, .09	xxx
JS	47.07	21	<.001	0.95	0.91	xxx	xxx	0.04

Table 2. Means, Standard Deviations, and Correlations - Day's 1 - 3

	Variable	*M*	*SD*	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1	Age	*34.60*	*9.47*	xxx															
2	Gender	*xxx*	*xxx*	.16	xxx														
3	Race	*xxx*	*xxx*	**-.21**	-.12	xxx													
4	Education	*xxx*	*xxx*	.06	-.01	.08	xxx												
5	Marital Status	*xxx*	*xxx*	**.56**	.16	-.19	-.03	xxx											
6	Occupation	*xxx*	*xxx*	-.14	.12	.00	-.01	.06	xxx										
7	Job Control	*2.40*	*.88*	**.32**	-.11	-.10	.14	**.26**	-.18	xxx									
8	Schedule Control	*xxx*	*xxx*	.18	-.16	-.04	.06	.18	**-.22**	**.72**	xxx								
9	Tenure	*6.10*	*5.11*	**.43**	.00	-.11	.02	**.38**	.05	**.27**	**.22**	xxx							
10	Supervisor Status	*xxx*	*xxx*	**-.26**	.06	-.13	.03	**-.25**	**.25**	**-.21**	**-.26**	**-.29**	xxx						
	Day 1																		
11	TSD	*1.24*	*1.20*	.08	.06	.18	-.03	.07	.04	-.10	-.09	-.10	.03	xxx					
12	DBQV	*1.33*	*1.20*	-.17	-.01	.02	.09	-.12	.11	.00	.08	-.08	.00	**.36**	xxx				
13	CS	*2.33*	*2.84*	-.08	.11	.15	**.24**	-.12	.07	-.01	.10	-.06	.11	**.40**	**.42**	xxx			
14	AR	*1.23*	*1.63*	.04	-.02	.11	.07	.03	.13	-.03	-.06	-.07	-.04	**.31**	**.32**	**.64**	xxx		
15	PSR	*1.48*	*1.24*	.08	-.05	.06	-.09	**.20**	.02	.08	.07	.14	-.12	**.31**	.19	.03	**.24**	xxx	
16	JS	*4.23*	*3.34*	-.11	-.01	.08	.03	-.07	**.20**	-.04	-.08	-.11	.07	**.35**	**.30**	**.57**	**.68**	.17	xxx
	Day 2																		
11	TSD	*1.17*	*1.04*	.01	**.22**	.19	.05	-.02	.04	**-.29**	**-.23**	-.14	.15	xxx					
12	DBQV	*1.36*	*1.31*	-.10	-.01	-.10	.00	.02	.02	-.07	-.03	-.05	.08	**.40**	xxx				
13	CS	*2.71*	*3.25*	-.10	.15	.02	.02	.05	.09	-.17	-.15	-.02	.12	**.57**	**.50**	xxx			
14	AR	*.90*	*1.45*	-.05	.15	.04	.07	.04	.02	-.02	-.06	-.08	.01	**.44**	**.45**	**.65**	xxx		
15	PSR	*1.20*	*1.34*	.19	.09	-.09	-.10	**.29**	-.12	.05	.18	.06	-.14	.14	.19	.20	**.31**	xxx	
16	JS	*4.14*	*3.42*	-.16	.08	-.05	.06	-.05	.12	-.08	-.05	.00	.11	**.47**	**.41**	**.66**	**.55**	.07	xxx
	Day 3																		
11	TSD	*1.22*	*1.22*	.12	.06	.18	.12	-.10	.08	-.11	-.14	-.19	.12	xxx					
12	DBQV	*1.22*	*1.27*	.00	.12	-.10	.14	-.05	.01	-.03	.01	-.04	.12	**.45**	xxx				
13	CS	*2.76*	*3.27*	.05	.10	-.03	.11	-.06	.11	-.01	.01	.07	.10	**.34**	**.42**	xxx			
14	AR	*.92*	*1.51*	.09	.08	-.09	.02	-.01	-.02	-.10	-.07	-.05	.14	**.31**	**.27**	**.62**	xxx		
15	PSR	*1.05*	*1.18*	.09	.14	-.07	-.16	.08	-.18	-.02	-.01	-.08	.01	.13	**.23**	.14	**.46**	xxx	
16	JS	*4.07*	*3.51*	-.05	.04	-.01	.10	-.15	.03	-.14	-.07	-.04	.08	**.41**	**.40**	**.71**	**.74**	**.30**	xxx

Note: **$p < .05$**; DBQV = risky commuting safety behaviors (driving violations subscale)

Table 3. Means, Standard Deviations, and Correlations - Day's 4 - 6

	Variable	*M*	*SD*	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1	Age	*34.60*	*9.47*	xxx															
2	Gender	*xxx*	*xxx*	.16	xxx														
3	Race	*xxx*	*xxx*	**-.21**	-.12	xxx													
4	Education	*xxx*	*xxx*	.06	-.01	.08	xxx												
5	Marital Status	*xxx*	*xxx*	**.56**	.16	-.19	-.03	xxx											
6	Occupation	*xxx*	*xxx*	-.14	.12	.00	-.01	.06	xxx										
7	Job Control	*2.40*	*.88*	**.32**	-.11	-.10	.14	**.26**	-.18	xxx									
8	Schedule Control	*xxx*	*xxx*	.18	-.16	-.04	.06	.18	**-.22**	**.72**	xxx								
9	Tenure	*6.10*	*5.11*	**.43**	.00	-.11	.02	**.38**	.05	**.27**	**.22**	xxx							
10	Supervisor Status	*xxx*	*xxx*	**-.26**	.06	-.13	.03	**-.25**	**.25**	**-.21**	**-.26**	**-.29**	xxx						
	Day 4																		
11	TSD	*1.13*	*1.22*	.07	-.09	**.31**	.06	.00	-.16	-.08	-.07	-.10	.00	xxx					
12	DBQV	*1.06*	*1.28*	-.06	.00	.02	**.29**	-.16	-.11	.00	-.02	.03	.10	.11	xxx				
13	CS	*2.31*	*2.87*	.03	.00	.03	.08	-.02	-.04	-.12	-.01	.02	.12	**.32**	**.22**	xxx			
14	AR	*.72*	*1.26*	-.04	.07	.02	.12	.02	-.06	-.18	-.03	-.03	.14	**.24**	**.35**	**.57**	xxx		
15	PSR	*.95*	*1.19*	.03	.07	-.03	.06	.10	-.10	-.06	.00	.04	-.07	.08	**.24**	.14	**.39**	xxx	
16	JS	*3.46*	*3.08*	-.15	-.05	.02	.10	-.09	-.02	-.12	.00	.02	**.21**	.14	**.25**	**.59**	**.54**	.11	xxx
	Day 5																		
11	TSD	*1.23*	*1.29*	-.07	.08	**.31**	.20	-.14	.06	**-.29**	-.17	-.17	.10	xxx					
12	DBQV	*1.07*	*1.23*	-.07	.11	-.09	.13	-.06	-.02	-.10	-.02	-.04	.04	**.28**	xxx				
13	CS	*2.18*	*2.69*	-.08	.10	-.01	.09	-.10	.12	**-.27**	-.17	-.15	.17	**.48**	**.41**	xxx			
14	AR	*.63*	*1.19*	.04	-.01	-.07	.03	-.10	-.10	**-.20**	-.17	-.03	.06	**.31**	**.36**	**.63**	xxx		
15	PSR	*.42*	*.88*	.00	-.03	-.03	.00	.03	-.06	.09	.12	-.08	.06	.01	**.22**	.16	**.38**	xxx	
16	JS	*3.30*	*3.04*	-.15	.01	-.03	.04	-.14	.12	**-.28**	-.15	-.02	.12	**.35**	**.31**	**.70**	**.62**	**.20**	xxx
	Day 6																		
11	TSD	*.93*	*1.08*	.04	-.03	.02	-.02	-.05	.05	**-.20**	-.13	-.10	.02	xxx					
12	DBQV	*.97*	*1.14*	-.11	.00	.08	.09	.03	-.12	-.04	.05	-.04	-.15	**.55**	xxx				
13	CS	*2.03*	*2.73*	-.13	-.07	.08	-.06	-.01	-.16	-.11	.10	-.01	.06	**.44**	**.38**	xxx			
14	AR	*.66*	*1.26*	-.06	.05	-.06	-.06	-.01	-.10	-.17	.03	-.01	.07	**.44**	**.34**	**.72**	xxx		
15	PSR	*.80*	*1.20*	.00	.03	-.05	-.13	.09	-.12	-.04	.02	-.05	-.16	**.35**	**.29**	**.32**	**.52**	xxx	
16	JS	*3.26*	*2.96*	-.16	.05	-.04	-.03	-.13	-.05	-.17	.00	-.02	.11	**.42**	**.27**	**.74**	**.71**	**.23**	xxx

Note: ***p* < .05**; DBQV = risky commuting safety behaviors (driving violations subscale)

Table 4. Means, Standard Deviations, and Correlations - Day's 7 - 9

	Variable	*M*	*SD*	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1	Age	*34.60*	*9.47*	xxx															
2	Gender	*xxx*	*xxx*	.16	xxx														
3	Race	*xxx*	*xxx*	**-.21**	-.12	xxx													
4	Education	*xxx*	*xxx*	.06	-.01	.08	xxx												
5	Marital Status	*xxx*	*xxx*	**.56**	.16	-.19	-.03	xxx											
6	Occupation	*xxx*	*xxx*	-.14	.12	.00	-.01	.06	xxx										
7	Job Control	*2.40*	*.88*	**.32**	-.11	-.10	.14	**.26**	-.18	xxx									
8	Schedule Control	*xxx*	*xxx*	.18	-.16	-.04	.06	.18	**-.22**	**.72**	xxx								
9	Tenure	*6.10*	*5.11*	**.43**	.00	-.11	.02	**.38**	.05	**.27**	**.22**	xxx							
10	Supervisor Status	*xxx*	*xxx*	**-.26**	.06	-.13	.03	**-.25**	**.25**	**-.21**	**-.26**	**-.29**	xxx						
	Day 7																		
11	TSD	*1.05*	*1.15*	.01	.06	**.22**	**.25**	-.07	.03	-.18	-.11	-.14	.09	xxx					
12	DBQV	*1.10*	*1.31*	-.12	.08	.03	**.21**	-.08	-.08	-.05	.07	-.05	.07	**.39**	xxx				
13	CS	*2.41*	*2.74*	-.10	.12	-.06	.10	.03	.14	**-.27**	-.11	.02	**.32**	**.32**	**.43**	xxx			
14	AR	*.72*	*1.29*	.03	.02	-.06	-.01	.00	.05	**-.21**	-.09	-.06	**.21**	**.35**	**.29**	**.57**	xxx		
15	PSR	*.84*	*1.19*	-.02	-.02	-.03	-.03	-.01	**-.20**	.04	.06	.07	-.12	.07	**.33**	.18	**.44**	xxx	
16	JS	*3.64*	*2.99*	-.14	.12	-.06	.03	-.01	.13	**-.25**	-.08	-.01	.14	**.24**	**.33**	**.72**	**.66**	.20	xxx
	Day 8																		
11	TSD	*1.01*	*1.16*	.10	.08	**.23**	.03	.05	-.05	**-.22**	-.17	-.10	-.06	xxx					
12	DBQV	*1.08*	*1.30*	-.11	-.05	.03	.10	.00	.00	-.01	.06	-.05	-.04	**.39**	xxx				
13	CS	*2.39*	*2.78*	.00	-.07	-.02	.06	.03	.03	-.09	.02	-.07	-.05	**.28**	**.47**	xxx			
14	AR	*.83*	*1.42*	.12	.08	.06	.02	.08	-.07	-.02	.04	-.08	-.04	**.40**	**.37**	**.61**	xxx		
15	PSR	*.84*	*1.19*	.13	.14	.04	.12	**.24**	-.15	.13	.11	.05	-.11	**.21**	**.24**	**.21**	**.47**	xxx	
16	JS	*3.84*	*3.17*	.06	.13	.00	.12	-.03	-.02	-.13	-.03	.01	-.01	**.34**	**.47**	**.71**	**.64**	**.25**	xxx
	Day 9																		
11	TSD	*1.22*	*1.38*	-.12	.07	**.26**	.19	-.05	.06	-.15	-.13	-.11	-.01	xxx					
12	DBQV	*1.09*	*1.33*	-.05	.07	.11	**.30**	.05	-.05	.02	.05	.02	-.04	**.50**	xxx				
13	CS	*2.20*	*2.66*	-.06	-.02	.01	**.18**	.09	-.01	**-.21**	**-.14**	-.04	.03	**.33**	**.35**	xxx			
14	AR	*.73*	*1.32*	.00	-.01	-.03	.00	.11	-.01	-.15	-.01	.07	-.06	**.36**	**.30**	**.62**	xxx		
15	PSR	*.98*	*1.38*	-.05	-.02	-.03	-.07	.16	-.09	.08	.06	.10	**-.20**	.08	.18	**.29**	**.50**	xxx	
16	JS	*3.18*	*3.19*	-.14	-.08	-.03	.02	-.03	-.12	**-.24**	-.07	.04	.07	**.33**	**.24**	**.63**	**.71**	**.30**	xxx

Note: **$p < .05$**; DBQV = risky commuting safety behaviors (driving violations subscale)

Table 5. Means, Standard Deviations, and Correlations - Day 10

	Variable	*M*	*SD*	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1	Age	*34.60*	*9.47*	xxx															
2	Gender	*xxx*	*xxx*	.16	xxx														
3	Race	*xxx*	*xxx*	**-.21**	-.12	xxx													
4	Education	*xxx*	*xxx*	.06	-.01	.08	xxx												
5	Marital Status	*xxx*	*xxx*	**.56**	.16	-.19	-.03	xxx											
6	Occupation	*xxx*	*xxx*	-.14	.12	.00	-.01	.06	xxx										
7	Job Control	*2.40*	*.88*	**.32**	-.11	-.10	.14	**.26**	-.18	xxx									
8	Schedule Control	*xxx*	*xxx*	.18	-.16	-.04	.06	.18	**-.22**	**.72**	xxx								
9	Tenure	*6.10*	*5.11*	**.43**	.00	-.11	.02	**.38**	.05	**.27**	**.22**	xxx							
10	Supervisor Status	*xxx*	*xxx*	**-.26**	.06	-.13	.03	**-.25**	**.25**	**-.21**	**-.26**	**-.29**	xxx						
	Day 10																		
11	TSD	*1.08*	*1.30*	-.07	-.06	**.26**	.02	-.14	-.06	-.12	.00	-.05	-.05	xxx					
12	DBQV	*.96*	*1.36*	.02	-.07	-.07	.19	.03	-.06	-.01	.05	.08	.06	**.51**	xxx				
13	CS	*2.15*	*2.71*	-.12	-.06	-.07	-.03	-.09	.05	-.18	**-.07**	.06	.08	**.40**	**.53**	xxx			
14	AR	*.72*	*1.29*	-.07	-.08	-.05	.00	-.14	.07	-.20	-.08	-.01	.11	**.37**	**.59**	**.72**	xxx		
15	PSR	*.48*	*.94*	.02	.07	.03	.05	.19	-.06	.06	.02	.05	-.20	**.24**	**.35**	**.28**	**.43**	xxx	
16	JS	*3.14*	*3.25*	**-.24**	-.02	-.06	-.09	**-.25**	.13	**-.36**	-.20	-.09	.19	**.21**	**.34**	**.71**	**.77**	.19	xxx

Note: ***p* < .05**; DBQV = risky commuting safety behaviors (driving violations subscale)

Table 6. Standardized regression weights for Hypothesis 1

Models	Variables	DBQV-W			DBQV-B		
		β	SE	R^2	β	SE	R^2
Level 1							
Direct Effects							
	CS-W	0.28***	0.05				
Controls							
	TSD	0.28***	0.05				
				0.15***			
Level 2							
Direct Effects							
	CS-B				0.47***	0.11	
Controls							
	SC				0.05	0.11	
	JC				0.04	0.11	
							0.22*

Note. $p < .05$*, $p < .01$**, $p < .001$***; DBQV = risky commuting safety behaviors (driving violations subscale).

Table 7. Standardized regression weights for Hypothesis 2

Models	Variables	DBQV-W			DBQV-B		
		β	SE	R^2	β	SE	R^2
Level 1							
Direct Effects							
	JS-W	0.12***	0.03				
Controls							
	TSD	0.17***	0.03				
				0.06***			
Level 2							
Direct Effects							
	JS-B				0.42***	0.11	
Controls							
	SC				0.05	0.12	
	JC				0.05	0.11	
							0.17

Note. *p* <.05*, *p* <.01**, *p* <.001***; DBQV = risky commuting safety behaviors (driving violations subscale).

Table 8. Standardized regression weights for Hypothesis 3

Models	Variables	AR-W			AR-B		
		β	SE	R^2	β	SE	R^2
Level 1							
Direct Effects							
	JS-W	0.57***	0.04				
Controls							
	TSD	0.07	0.04				
				0.35***			
Level 2							
Direct Effects							
	JS-B				0.74***	0.08	
Controls							
	SC				-0.41	0.07	
	JC				0.08	0.07	
							0.53***

Note. *p* <.05*, *p* <.01**, *p* <.001***.

Table 9. Standardized regression weights for Hypothesis 4

	DBQV			AR			Indirect Effect			
	β	SE	R^2	β	SE	R^2	Est.	SE	95% Bayes CI	
Level 1										
Direct Effects										
JS-W	0.06*	0.03		0.59***	0.04					
AR-W	0.10**	0.03								
Controls										
TSD	0.17***	0.03								
			.061***			.349***				
Indirect Effect										
JS -- AR -- DBQV							0.034*	0.01	0.01	0.06
Level 2										
Direct Effect										
JS-B	0.18	0.15		0.73***	0.08					
AR-B	0.32*	0.14								
Controls										
SC	0.06	0.11								
JC	0.03	0.11								
			0.23*			0.53***	0.095*	0.04	0.02	0.16
Indirect Effect										
JS -- AR -- DBQV										

Note. p <.05*, p <.01**, p <.001***; DBQV = risky commuting safety behaviors (driving violations subscale).

Table 10. Standardized regression weights for Hypothesis 5

Models	Variables	DBQV-W			DBQV-B		
		β	SE	R^2	β	SE	R^2
Level 1							
Direct Effects							
	CS-W	0.14***	0.03				
	AR-W	0.34	0.04				
	PSP-W	0.02	0.03				
Interactions							
	CS*AR-W	0.11*	0.05				
	CS*PSP-W	-0.03	0.04				
Controls							
	TSD	0.14***	0.03				
				0.09***			
Level 2							
Direct Effects							
	CS-B				0.49*	0.20	
	AR-B				0.31	0.24	
	PSP-B				0.24	0.17	
Interactions							
	CS*AR-B				-0.35	0.35	
	CS*PSP-B				-0.05	0.28	
Controls							
	SC				0.07	0.11	
	JC				-0.03	0.10	
							0.31***

Note. $p<.05$*, $p<.01$**, $p<.001$***; DBQV = risky commuting safety behaviors (driving violations subscale).

Table 11. Standardized regression weights for Research Question 1

Models	Variables	DBQV-W			DBQV-B		
		β	SE	R^2	β	SE	R^2
Level 1							
Direct Effects							
	PSP-W	0.05	0.03				
Controls							
	TSD	0.21***	0.03				
				0.047*			
Level 2							
Direct Effects							
	PSP-B				0.40***	0.07	
Controls							
	SC				0.09	0.13	
	JC				-0.12	0.14	
							0.17*

Note. *p* <.05*, *p* <.01**, *p* <.001***; DBQV = risky commuting safety behaviors (driving violations subscale).

Table 12. Standardized regression weights for Supplemental Analyses

	DBQV			PSP			Indirect Effect			
	β	SE	R^2	β	SE	R^2	Est.	SE	95% Bayes CI	
Level 2										
Direct Effect										
JS-B	0.34*	0.11		0.22*	0.07					
PSP-B	0.32***	0.08								
Controls										
SC	0.05	0.11								
JC	-0.01	0.11								
			0.23*			0.53***				
Indirect Effect										
JS -- PSP -- DBQV							0.028*	0.01	0.01	0.05

Note. p <.05*, p <.01**, p <.001***; DBQV = risky commuting safety behaviors (driving violations subscale).

Table 13. Standardized regression weights for Supplemental Analyses

Models	Variables	DBQV-W			DBQV-B		
		β	SE	R^2	β	SE	R^2
Level 1							
Direct Effects							
	Time	0.01	0.04				
	Distance	0.02	0.02				
Controls							
	TSD	0.21***	0.03				
				0.05**			
Level 2							
Direct Effects							
	Time				0.03	0.16	
	Distance				0.26	0.16	
Controls							
	SC				0.08	0.13	
	JC				-0.03	0.14	
							0.08

Note. $p < .05$*, $p < .01$**, $p < .001$***; DBQV = risky commuting safety behaviors (driving violations subscale).

Table 14. Standardized regression weights for Supplemental Analyses

	DBQV			AR			Indirect Effect			
	β	SE	R^2	β	SE	R^2	Est.	SE	95% Bayes CI	
Level 1										
Direct Effects										
JS-W	0.02	0.03		0.60***	0.03					
AR-W	0.02	0.04								
CS-W	0.14***	0.03								
Interaction										
CS*AR-W	0.09*	0.05								
Controls										
TSD	0.17***	0.03								
			0.08***			0.36***				
Indirect Effect										
JS -- AR -- DBQV							0.01	0.01	-0.03	0.03
Level 2										
Direct Effect										
JS-B	0.01	0.19		0.73***	0.08					
AR-B	0.22	0.17								
CS-B	0.32	0.21								
Controls										
SC	0.06	0.12								
JC	0.03	0.12								
			0.16*			0.53***				
Indirect Effect										
JS -- AR -- DBQV							0.06	0.05	0.00	0.13

Note. $p < .05$*, $p < .01$**, $p < .001$***; DBQV = risky commuting safety behaviors (driving violations subscale).

Figure 1: Proposed Conceptual Model

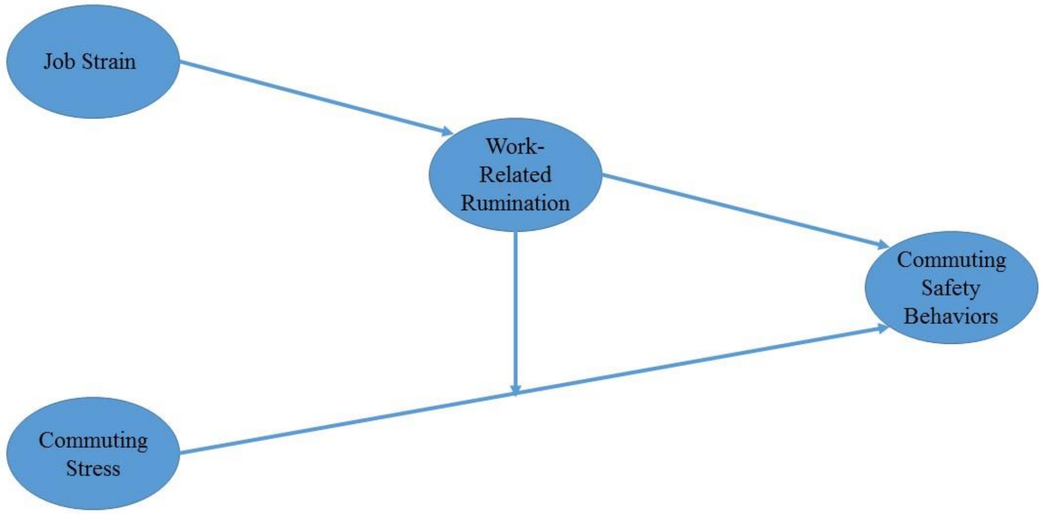


Figure 2. Interaction of Daily Affective Rumination on the Relationship between Daily Commuting Stress and Daily Risky Commuting Safety Behaviors

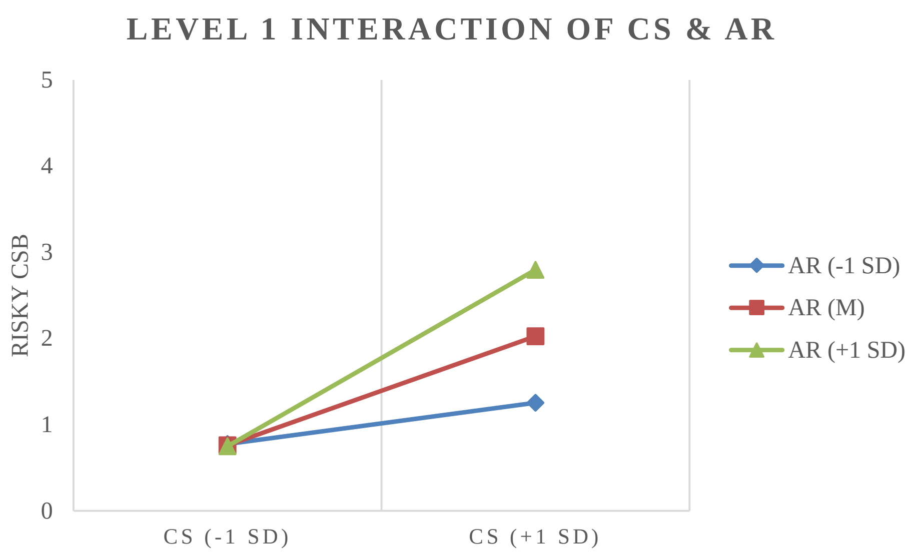


Figure 3. Full Path Model – Supplemental Analyses

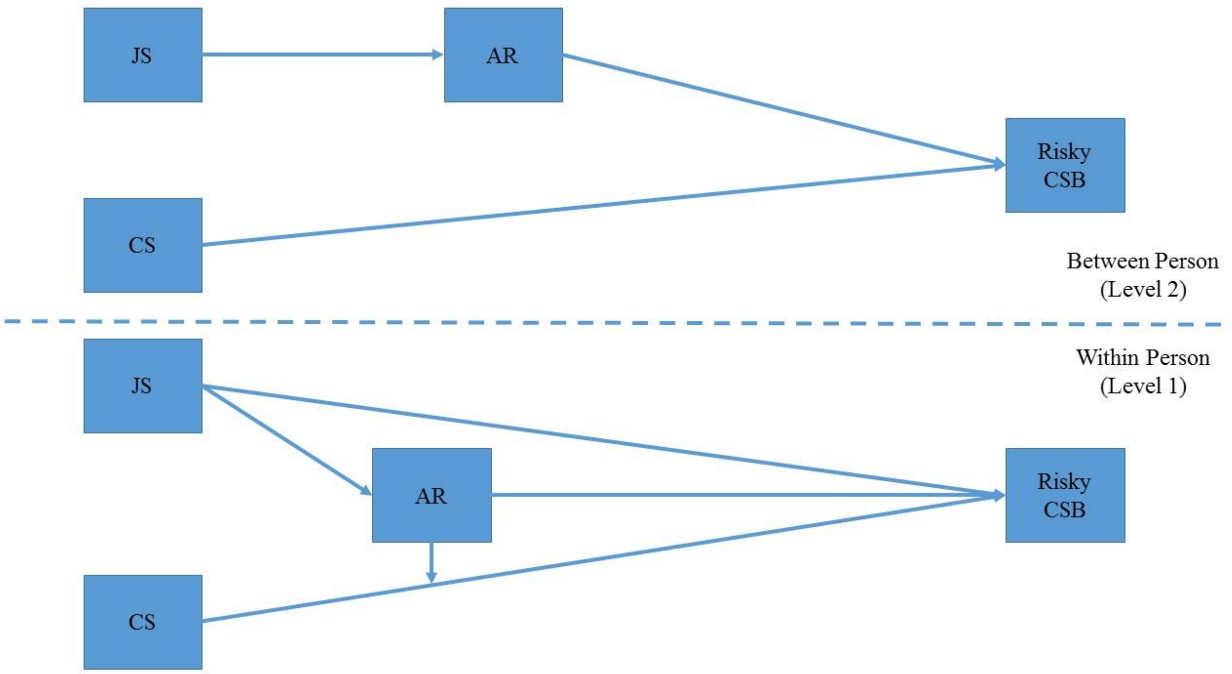
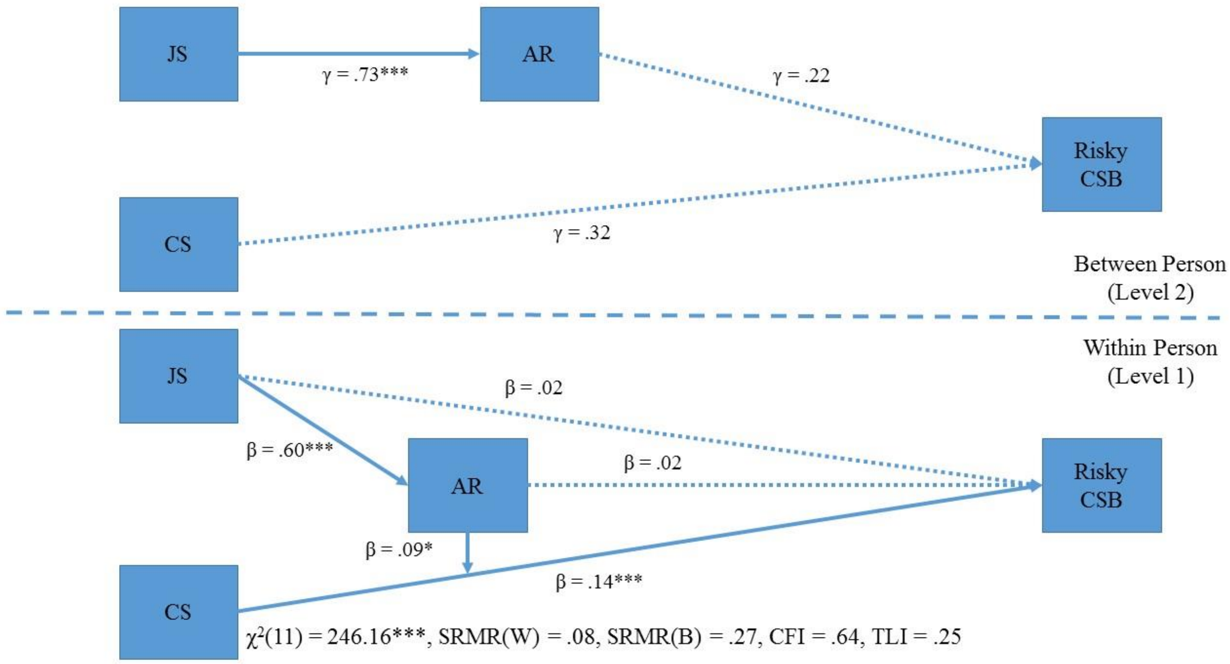


Figure 4. Supplement Analysis showing the full path model results.



Appendix A

Daily Survey Codebook

Impedance (2)			
REFERENCE:			
Q#	**Var. Name**		**Response Scale**
	ComH_Avg	How much time (in minutes) did it take you to commute from work to home today? (From the moment you left work to the moment you arrived at home)	Numeric Open
	Distance	How many miles was your commute from work to home today?	Numeric Open
Commuting Safety Behaviors (15)			
REFERENCE: Parker, D., Reason, J.T., Manstead, A.S.R., & Stradling, S.G. (1995). Driving errors, driving violations, and accident involvement. *Ergonomics, 33*, 1315-1332.			
STEM: Think about your commute home from work today and indicate whether you did any of the following:			
Q#	**Var. Name**		**Response Scale**
	DBQ_viol1	I disregarded the speed limits	0 = no 1 = yes
	DBQ_viol2	I became impatient with a slow driver	
	DBQ_viol3	I drove too close to the car in front in order to get them to go faster or get out of the way	
	DBQ_viol4	I didn’t come to a complete stop at a stop sign	
	DBQ_viol5	I went through an intersection on a yellow or red light	
	DBQ_error1	I failed to notice a pedestrian(s) crossing in front of me	
	DBQ_error2	I failed to check my rearview mirror before pulling out or changing lanes	
	DBQ_error3	I stepped on the brakes too hard on a slippery road	
	DBQ_error4	I stepped on the brakes hard enough to be jolted in my seat	
	DBQ_lapse5	I forgot where I parked my car	
	DBQ_lapse6	I switched something on (example: headlights) when I meant to turn on something else (example: windshield wipers)	
	DBQ_lapse1	I misread traffic signs (speed, roads, exits)	
	DBQ_lapse2	I hit something while reversing that I had not previously seen	
	DBQ_lapse3	I left my dome light or headlights on	
Commuting Predictability (3)			
REFERENCE: Evans, G.W., Wener, R.E., & Phillips, D. (2002). The morning rush hour: Predictability and commuter stress. *Environment and Behavior*, *34*, 521-530.			
STEM: Think about your commute home from work today and indicate your response to the following.			
Q#	**Var. Name**		**Response Scale**
	Comm_predict1	I knew how long my commute home was going to take	0 = no 1 = yes
	Comm_predict2	I could predict what time I got home	
Commuting Control (3)			
REFERENCE: Evans, G.W., Wener, R.E., & Phillips, D. (2002). The morning rush hour: Predictability and commuter stress. *Environment and Behavior*, *34*, 521-530.			
STEM: Think about your commute home from work today and indicate your response to the following.			
Q#	**Var. Name**		**Response Scale**
	Comm_control1	I could control how long it took me to get home	0 = no 1 = yes
	Comm_control2	I had no control over my commute home	

Commuting Stress (11)

REFERENCE: Folkman, S. & Lazarus, R.S. (1985). If it changes it must be a process: Study of emotion and coping during three stages of a college examination. *Journal of Personality and Social Psychology, 48*, 150-170. (items 1-2)

Morrow, S. L. & Barnes-Farrell, J. L. (2008, March). Commuting Stress Spillover: Implications for Work-to-Family Conflict. In S. L. Alton & T. M. Bludau (Co-Chairs), *Commuting Stress: Contributors, Consequences, and Implications for Coping.* Paper presented at the NIOSH-APA Work, Stress, and Health Conference, Washington, DC. (items 1-5)

Koslowsky, M. & Krausz, M. (1993). On the relationship between commuting, stress symptoms, and attitudinal measures: A LISREL Application. *Journal of Applied Behavioral Science, 29(4),* 485-492. (items 2, 3, 11)

Stanton, J., Balzer, W., Smith, P., Parra, L., & Ironson, G. (2001). A general measure of work stress: the stress in general scale. *Educational and Psychological Measurement, 61(5),* 866-888. (items 3-7)

STEM: Please indicate if you felt any of the following during your commute home today:

Q#	Var. Name		Response Scale
	Comm_stress1	Anxious	0 = no 1 = yes
	Comm_stress2	Angry	
	Comm_stress3	Calm (R)	
	Comm_stress4	Worried	
	Comm_stress5	Irritated	
	Comm_stress6	Overwhelmed	
	Comm_stress7	Annoyed	
	Comm_stress8	Relaxed (R)	
	Comm_stress9	Nervous	
	Comm_stress10	Comfortable (R)	

Psychological Commute Safety Behavior (1)

REFERENCE: XX.

STEM: Think about your commute home from work today and indicate your response to the following.

Q#	Var. Name		Response Scale
	PsycCommSafety	I felt I was safe in how I drove home from work today	0 = No 1 = Yes

Emotional Strain (3)

REFERENCE: Demerouti, E., Bakker, A.B., Vardakou, I., & Kantas, A. (2003). The convergent validity of two burnout instruments: A multitrait-multimethod analysis. European Journal of Psychological Assessment, 19(1), 12-23. doi: 10.1027//1015-5759.19.1.12.

INSTRUCTIONS: Please think about work today and your experience after work and indicate your response to the following:

Q#	Var. Name		Response Scale
	Emo_Strain1	Today at work, I felt emotionally drained	0 = no 1 = yes
	Emo_strain2	Today after work, I had enough energy for leisure activities	
	Emo_strain3	Today after work, I felt worn out and weary	

Cognitive Strain (5)

REFERENCE: Chalder, T., Berelowitz, G., Pawlikowska, T., Watts, L., Wessely, S., Wright, D., & Wallace, E.P. (1993). Development of a fatigue scale. Journal of Psychosomatic Research, 37(2), 147-153.

INSTRUCTIONS: Please think about your work experience today and indicate your response to the following:

Q#	Var. Name		Response Scale
	Cog_strain1	I had difficulty concentrating	0 = no 1 = yes
	Cog_strain2	I had problems thinking clearly	
	Cog_strain3	I found it more difficult to find the right word	
	Cog_strain4	I lost interest in the work tasks I usually enjoy	

Job Stress in General (12)			
REFERENCE: Stanton, J., Balzer, W., Smith, P., Parra, L., & Ironson, G. (2001). A general measure of work stress: The stress in general scale. Educational and Psychological Measurement, 61(5), 866-888.			
STEM: Please indicate if you felt any of the following during your workday today:			
Q#	**Var. Name**		**Response Scale**
	Job_stress1	Pressured	0 = no 1 = yes
	Job_stress2	Hectic	
	Job_stress3	Calm (R)	
	Job_stress4	Stressed	
	Job_stress5	Irritated	
	Job_stress6	Nerve-wracked	
	Job_stress7	Hassled	
	Job_stress8	Comfortable (R)	
	Job_stress9	Overwhelming	

Usual Route (1)			
Q#	**Var. Name**		**Response Scale**
	Usual	Did you take your usual route home?	0 = no 1 = yes

Travel Speed Disruptions (5)			
REFERENCE: Novaco, 1990			
INSTRUCTIONS: TODAY was your travel speed on the way home reduced due to:			
Q#	**Var. Name**		**Response Scale**
	SpeedH1	Heavy traffic	0 = no 1 = yes
	SpeedH2	Accidents	
	SpeedH3	Traffic signals	
	SpeedH4	Slow moving vehicles	
	SpeedH5	Bad weather	

Work-related Rumination Questionnaire (15)			
REFERENCE: Cropley, M., Michalianou, G., Pravettoni, G., & Millward, L.J. (2012). The relation of post-work ruminative thinking with eating behavior. *Stress and Health, 28,* 23-30. doi: 10.1002/smi.1397			
STEM: Please indicate if you felt this way during your commute home this evening:			
Q#	**Var. Name**		**Response Scale**
	Aff_rum1	I was annoyed by thinking about work-related issues	0 = no 1 = yes
	Aff_rum2	I was irritated by work issues	
	Aff_rum3	I was fatigued by thinking about work-related issues	
	Aff_rum4	I was troubled by work-related issues	
	Prob_rum1	I thought of how I can improve my work-related performance	
	Prob_rum2	I re-evaluated something I had done at work	
	Prob_rum3	I thought about tasks that need to be done at work the next day	
	Prob_rum4	I found solutions to work-related problems	
	Detach1	I was able to stop thinking about work-related issues	
	Detach2	I found it easy to unwind from work	
	Detach3	I made myself switch off from work as soon as I left my work	
	Detach4	I left work issues behind as soon as I left my work	