The Demands and Resources of Work and Family: A Longitudinal Study of their Effects on the Risk of Injuries in the Workplace

Amit Kramer
School of Labor and Employment Relations
University of Illinois at Urbana-Champaign
247 LER Building
kram@illinois.edu

Seong Hee Cho
Department of Psychology
University of Illinois at Urbana-Champaign
327 Psychology Building
scho59@illinois.edu

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Abstract

Workplace injuries have negative consequences for individuals, families, organizations, and society as a whole. In this study, we expand upon the job demands-resources (JD-R) model to include family demands and resources, as well as individual resources, and test longitudinally both between- and within-person antecedents of workplace injuries. We use nine waves of data from the National Longitudinal Survey of Youth (NLSY79) and follow the same individuals over a 12-year period. Using a multilevel logistic regression model, we find that both family and work demands increase the probability of workplace injuries. We also find contradictory effects at the between- and within-person levels: for instance, a spouse's work hours are negatively associated with the probability of suffering a workplace injury between-person (i.e., an individual whose spouse works more is less likely to get injured at work); however, it is positively associated with the probability of suffering a workplace injury within-person (i.e., an individual will be more likely to experience workplace injury if his/her spouse increases their work hours). We discuss our findings and their implications for individuals, organizations, and policy makers.

Introduction

Workplace injuries have been a topic of great interest in the field of management, human resources, and Industrial/Organizational (I/O) psychology. Although injuries in the workplace are generally considered low-frequency events, the consequences can be serious for individual workers and their families, organizations, and policy makers. According to the Bureau of Labor Statistics (U.S. Department of Labor, 2014) private industry employers reported more than 3 million nonfatal workplace injuries and illnesses in 2013 alone. Of those, 94.9% were workplace injuries and 5.1% were workplace related illnesses, which amount to 3.3 cases of injury/illness per the equivalent of 100 full-time workers. The cost of workplace injuries and illnesses to the U.S. economy is estimated at $200-550 billion annually (Bureau of Economic Analysis, 2008; Eisenbrey, 2013; Leigh, 2011) and economic losses are equivalent to 4-5% of the global gross domestic product (World Health Organization, 2008). Workplace injuries also incur non-economic but equally significant costs, such as the growth of distrust in management, job dissatisfaction, and exit (Barling, Kelloway, & Iverson, 2003a). Given the significant human and economic costs they represent, it is critical to understand the antecedents of workplace injuries and the larger context in which the risks of such occurrences take place.

Studies of workplace injuries tend to focus on occupational safety and climate factors, as well as issues pertaining to the organizational level, such as high-performance work systems (e.g., Barling, Kelloway, & Iverson, 2003b; Zacharatos, Barling, & Iverson, 2005) and characteristics of the job itself that may require accepted risks and hazards, autonomy, and physical demands (e.g., Barling et al., 2003a,b; Nahrgang, Morgeson, & Hofmann, 2011). In addition, most studies on workplace injuries are cross-sectional (e.g., Barling et al., 2003b; Frone, 1998; Zacharatos et al., 2005). As stated by Nahrgang and colleagues in their meta-analysis of safety at work (2011), most studies on workplace injuries use constructs that are assessed "at the same time, [making it] impossible to draw strong causal inferences" (p. 87). The few studies that do use longitudinal design have a short time horizon of only a few months, and are mostly focused on safety climate and not actual injuries, and are only able to observe between- and not within-subject antecedents of workplace injuries (e.g., Mullen & Kelloway, 2009; Probst & Brubaker, 2001; Tharaldsen, Olsen, & Rundmo, 2008; Westaby & Lee, 2003). As such, current research tends to be limited in its capacity to draw causality from the available data, and does not allow significant opportunity for observing and estimating the antecedents of low-frequency events, such as workplace injuries.

Another limitation of most studies on workplace injuries is that they treat all injuries similarly and do not differentiate them by type or etiology (e.g., Barling et al., 2003a,b; Frone, 1998; Reilly, Paci, & Holl, 1995; Seabury, Mendeloff, & Neuhauser, 2014). However, some injuries are more accidental in nature (e.g., getting hit by a moving object), some are related to functional disability (e.g., strains and sprains from repetitive physical movements necessitated by a work-related task), while others pertain to mental illnesses or stress related to work performance (e.g., emotional breakdowns, anxiety or work-related depression) among other conditions. It is therefore possible that these different types of injuries have multiple predictors; or, that some predictors are stronger for some types of injuries and weaker for others.

In this study, we apply the job demands-job resource model (JD-R model, Bakker & Demerouti, 2007; Demerouti Bakker, Nachreiner, & Schaufeli, 2001) with the goal of understanding the role that work, family, and individual demands and resources have in determining the probability of a workplace injury. We specifically focus on demands that individuals face at work (e.g., long work hours and shift work) and family (e.g., number of children, age of youngest child, and a spouse's work hours). We also examine the effect of resources on the probability of workplace injuries. Resources include those that originate at work but also within the family domain (e.g., tenure, income, and marital status) as well as an intra-individual resource (core self-evaluations or CSE). Our focus on a longitudinal perspective of the multiple demands that individuals face, as well as the resources that individuals possess, has the potential to extend our understanding of workplace injuries at both individual and organizational levels. Such a focus may place organizations in a better position to offer more comprehensive policies that would address the challenges and demands that individual employees confront and which increase the risk of workplace injuries, as well as better facilitate the utilization of resources that reduce the probability of suffering from them. Additional contributions made by this study are demonstrated in its ability to observe both between- and within-individual factors that relate to workplace injuries. Specifically, we use 9-waves of data from the National Longitudinal Survey of Youth (NLSY79) over a 13-year period (1988-2000) taken from individuals who were 23-31 years old in 1988. These data allow us to overcome the limitations of many previous studies on workplace injuries by observing the demands that individuals face and the resources they possess before an injury occurs. In turn, this allows us to draw stronger causality between the various factors in an individual's work and family life that may lead up to an injury.

In sum, research has focused on individual-specific and work-specific variables as potential predictors of workplace injuries, mostly using cross-sectional or short duration designs. We expand upon previous research by examining the effect of objective work *and* family demands on workplace injuries. While individual-level work demands (e.g., work pressure) have been examined in previous studies (see the meta-analysis of Christian, Bradley, Wallace, &

Burke, 2009), individuals face demands from both work and family that consume their resources and can be useful for work injury prevention. Our approach expands upon the JD-R model (Bakker & Demerouti, 2007; Demerouti et al., 2001) by broadening its scope from focusing exclusively on the work domain to expand upon an analysis of both work and family domains. This broader utilization of the JD-R model addresses a long-standing shortcoming of the work-family literature, which tends to consider the individual-level independently from the family-level. Furthermore, most studies treat different types of injuries as similar, although many work accidents and injuries may have numerous etiologies, sources, and degrees of severity. Finally, by using a longitudinal design we address a major limitation of the literature. In the most recent meta-analysis on workplace injuries and safety (Christian et al., 2009), only 4 out of 90 samples used longitudinal designs to examine the antecedents of injuries that occurred in the workplace. We thus address the call by Christian and colleagues, who suggest that, "future research is needed to further the understanding of occupational safety, particularly with an emphasis on theoretically longitudinal research designs" (p. 1123).

Theory and Hypotheses

Extending the Job Demands-Job Resources Model

The JD-R model (Bakker & Demerouti, 2007; Demerouti et al., 2001) proposes that jobs include both demands and resources. Demands impose a burden on individuals and require a sustained physical, cognitive, and emotional effort. The effort individuals make to perform their work is associated with physical and psychological depletion. This depletion can lead directly to a physical workplace injury, as well as to a deprivation of energy and attention required to uphold proper work performance, which can, when diminished, lead indirectly to a workplace injury. Examples of job demands are long work hours and irregular shift-work (Dai, Milkman, Hofmann & Staats, 2015; Kramer & Chung, 2015; Mullins, Cortina, Drake, & Dalal, 2014). The JD-R model further suggests that jobs include resources that allow employees to reduce the physical and psychological costs of job demands. Furthermore, resources also have the potential to motivate employees (Nahrgang et al., 2011). In the context of workplace injuries, resources may motivate employees to engage in safer behavior and follow safety regulations. Resources can derive from the work itself as well as from social aspects of the work (Nahrgang et al., 2011). Two examples of job resources that an individual can possess are work experience and tenure.

The separation between the work and family domains is prevalent in previous research. Yet, such a separation limits our ability to understand the actual impact of demands and resources that come from the combination of both work and family. Paying attention to both as a dynamic and simultaneous coupling of forces is especially important given the increased blurring of the boundaries between work and family. As such, an artificial separation of these domains by researchers is severely limiting our understanding of the interface between work and family (Kramer & Chung, 2015). We therefore extend the JD-R model to the family and intra-individual domains. We contend that the family domain can also impose demands as well as provide individuals with important resources. Family demands may include any physical, cognitive, or emotional investment that are required outside the workplace. These different types of family demands can range from the number of children a person has, or their age, to the work hours of an individual's spouse or partner. For example, it would be safe to assume that individuals with more children spend more time meeting the physical, cognitive, and emotional demands required of parenting, and perform more physical care of children, or various tasks associated with school age children like helping with homework and greater provision of emotional support. The long work hours of a spouse or partner can also be perceived as a demand upon an individual, because it results in the insufficient support of meeting demands within the family domain where two partners or spouses are usually required to take care of a household, caregiving and childcare duties (Kramer & Chung, 2015). Because an individual's time and energy resources are finite (Edwards & Rothbard, 2000), any effort invested in meeting family demands is likely to come at the expense of the individual's ability to cope with demands at work, including those that help prevent work injuries (e.g., attention to details and following safety regulations). This interdependency between work and family also extends to the potential wealth of personal resources that are available to an individual within both domains. Resources obtained from family can provide individuals with time and energy that can be used to buffer work demands and allow the individual to more effectively achieve organizational goals. For example, family resources, such as being married and having children, may provide the individual with a greater sense of responsibility as a provider, which may lead to more precautious attitudes or higher risk prevention compliance behaviors in the workplace. Resources such as higher income may allow individuals to afford outsourcing certain tasks to meet family demands (e.g., paying hired help for childcare), which in turn leave individuals with more time to replenish the resources they need to meet work demands.

These differential effects of work/family demands and resources on the risk or prevention of work injuries can be more intuitively addressed when within- and between-subjects level effects are estimated. Multilevel analyses provide different perspectives on the relationship between the same constructs of interest when they are understood at different levels. More specifically, multilevel modeling estimates whether or not employees who work a greater number of hours are more likely to suffer from a workplace injury than employees who work less hours (between-subjects effect) as well as testing whether an employee who increases his or her work hours year-over-year also augments their probability of experiencing a workplace injury (within-subject effect). This brings us to the following hypotheses concerning the effects of both work *and* family demands and resources on workplace injuries:

Hypothesis 1a: Work demands (work hours, irregular shift work) are positively related to the probability of suffering a workplace injury, both between- and within-subject.

Hypothesis 1b: Family demands (number of children, age of youngest child, spouse work hours) are positively related to the probability of suffering a workplace injury both between- and within-subject.

Hypothesis 2a: Work resources (income, tenure) are negatively related to the probability of suffering a workplace injury both between- and within-subject.

Hypothesis 2b: Family resources (marriage) are negatively related to the probability of suffering a workplace injury both between- and within-subject.

In the JD-R model, resources are considered external to the individual. They are derived from the organization (e.g., safety climate), social relations (e.g., supervisor support), work design (e.g., flexible work arrangements), and the task itself (Bakker & Demerouti, 2007; Demerouti et al., 2001; Nahrgang et al., 2011). However, research on workplace injuries has a long tradition of treating individual dispositions as resources that can be deployed to achieve superior personal and work outcomes. In the context of workplace injuries, studies have focused on personality traits, affects, and cognitive factors as predictors of workplace accidents (Frone, 1998; Hansen, 1989; Iverson & Erwin, 1997). Christian and colleagues (2009) summarize the effect of personality traits on workplace injuries, accidents, and safety in a meta-analysis and find that conscientiousness, neuroticism, and locus of control stand out as statistically significant predictors of workplace injuries (mean corrected correlation = -.26, .19, and -.26 respectively).

Both neuroticism and locus of control are facets of core self-evaluations (CSE) in addition to self-esteem and self-efficacy (Judge & Bono, 2001; Judge, Locke, & Durham, 1997). In their meta-analysis Christian and colleagues (2009) considered self-efficacy as a motivating factor in preserving safety, which had a significant effect on safety compliance (.57) but was not tested as a direct predictor of injuries.

CSE as a higher-order construct (Judge & Bono, 2001) can be defined as a dispositional evaluation that individuals hold about themselves (Judge et al., 1997). We argue that individuals with higher CSE are less likely to suffer from a workplace injury: higher CSE increase the individual's ability to behave safely, follow safety regulations, and control their environment in a manner that reduces the risk of an injury. We therefore suggest that CSE should be considered a resource an individual utilizes to reduce the likelihood of suffering from a workplace injury.

Hypothesis 3: Core self-evaluations (CSE) are negatively related to the probability of suffering a workplace injury.

Differentiating Accidental Injuries, Functional Injuries, and Psychological Injuries

Workplace injury is defined as bodily damage that results from work-related activity and is usually classified by the location of the body part that is affected, such as the spine, hands, head, lungs, eyes, skeleton, and skin (Barling & Frone, 2004). According to the Occupational Injury and Illness Classification System (OIICS; Bureau of Labor Statistics, 2012), injuries can be classified in four different ways: by the nature of injury or illness (e.g., traumatic or systemic); by the part of body affected (e.g., head or trunk); by the source of the injury (e.g., whether the injury was inflicted by a machine or a structure); and, the event or exposure (e.g., violence, explosion, or a fall). However, workplace injuries in most available studies are treated as a composite variable, without considering whether they could be predicted differently on the basis of their potential cause(s). Therefore, we are attempting to differentiate between the injuries themselves. Specifically, we differentiate physically-related injuries from all other types of injuries and illnesses, such as those which are biologically determined or related to mental illness induced by work environment (e.g., stress, anxiety or depression).

Physical injuries are a consequence of workplace accidents. They include, for example, crushing injuries, fractures and open wounds to the skull, spine, trunk, and limbs (Bureau of Labor Statistics, 2012). Such injuries are more likely to be the result of an inability to meet work and family demands and insufficient time-related resources that create greater pressure to satisfy increasing workloads (e.g., Clarke, 2012; Halbesleben, 2010; Nahrgang et al., 2011). To compensate time shortages and work pressures, individuals may “cut corners” (e.g., ignore time-consuming safety procedures; Hechanova-Alampay & Beehr, 2001; Probst & Brubaker, 2001; Zohar, 2002). As such, we expect time-related demands (e.g., work hours and the work hours of a spouse) to be positively related to such injuries more than other demands (e.g., age of youngest child). Similarly, we expect “time-freeing” resources (e.g., income) to be negatively related to such injuries in comparison to other resources (e.g., marital status).

Hypothesis 4: Time-related work and family demands (work hours and spouse's work hours) will be more strongly related to physically-related injuries than to other types of injuries.

Both physical injuries and mental-health issues that arise in the workplace are illnesses that result in a function or system failure (Bureau of Labor Statistics, 2012) and are more likely to be the result of an employee's inability to meet energy-related work and family demands, or caused by insufficient energy-related resources. Prior research has shown that some common work-related illnesses and injuries (e.g., cardiovascular and musculoskeletal diseases, as well as mental illness) are positively related to work demands that deplete employees of necessary physical and intellectual energy resources. These include low control over one’s job and schedule, which are negatively related to energy replenishing resources, such as social support (Johnson & Hall, 1988; Kivimäki et al., 2002) and other factors that create job strains (Kivimäki et al., 2002), and high psychosocial demands (da Costa & Vieira, 2010; Kivimäki et al., 2012). Several studies (see a review by Puttonen, Harma, & Hublin, 2010) have identified shift work as a predictor of increasing the risk of cardiovascular disease, although no specific mechanism was identified. In sum, literature on the relationship between work and health has demonstrated that energy-related demands, especially the control an individual has over a job and shift work, are connected to the increasing likelihood of stress-related disease.

Less research has examined the relationship between family demands and biologically-related workplace illnesses. Studies have found a positive linear relationship between the number of children and a working mother's risk of developing cardiovascular diseases (LaCroix & Haynes, 1987; Lundberg & Frankenhaeuser, 1999). However, such a relationship has not been observed for men, whether or not they had children. As such, we expect energy-related demands (shift work, number of children, and the age of youngest child) to be positively related to biological injuries and mental illnesses more than other demands (work hours, spouse's work hours). Similarly, we expect the type of resources that replenish energy through social support (marital status) to be negatively related to these illnesses and injuries more than other types (e.g., income).

Hypothesis 5: Energy-related work and family demands (shift work, number of children, and age of youngest child) will be more strongly related to biologically- and mentally-related injuries and illnesses than to physically-related injuries.

Method

Sample

The National Longitudinal Survey of Youth (NLSY79) is a nationally representative panel study administrated by the Bureau of Labor Statistics. The sample encompasses 12,686 individuals who were 14- to 22-year old when first surveyed in 1979. Participants were interviewed annually until 1994 and then on a biennial basis. Because time is modeled in our estimations, this data discontinuity after 1994 is accounted for. In our sample, we include all individuals who completed the survey between 1988 (when participants were 23-31 years old) and 2000 (when participants were 35-43 years old) because those are the years in which the NLSY79 collected work injury data. There were 8,033 participants who completed the survey in 2000. Not including the participants who were dropped due to financial constraints and death, the overall retention rate is 83.1%. For our sample, we only included participants who worked at least 20 weekly hours in a given year, and no more than 100. We chose the 20-hour-weekly cutoff due to the potentially negative effects on a person's health of working fewer hours than desired, which is well documented in the literature (e.g., Feldman, 1996; Friedland & Price, 2003; McKee-Ryan, Song, Wanberg, & Kinicki, 2005). We chose a cutoff of 100 weekly hours because such an intense working schedule is unrealistic (more than 14 hours a day, seven days a week) and was reported by very few subjects, most of whom were self-employed. Finally, we only included individuals with at least 3 observations over time to allow us modeling within-subject change. Listwise deletion was used to handle missing data. Our final sample size includes 5,463 individuals who meet these inclusion criteria.

Measures

Dependent variable

Injury. At each wave of the NLSY79, respondents were asked to report if they had suffered from any work-related injury or illness since the last interview. Respondents then reported if they had suffered from an injury or an illness. Between 1988 and 2000 there were 5,236 observations of injuries or illnesses (out of 71,768 observations), with some respondents reporting multiple incidents. Overall, 91.8% of the observations are of injuries (N = 4,807) and 8.2% are of an illness (N = 429).

Type of injury. We used the Occupational Injury and Illness Classification System (OIICS; Bureau of Labor Statistics, 2012) to classify injuries into two groups. The first group includes those that are accidental (e.g., crushing injuries, fractures, and open wounds to skull, spine, trunk, and limbs; Bureau of Labor Statistics, 2012). Such injuries are likely to be accidental and/or external to the person; more specifically, the cause relates to an outside force with which a person may come into contact in the workplace (e.g., getting hit by an object or piece of equipment, or an injury that results from contact with a machine). All other types of injuries were collapsed to non-accidental injuries and include those that are a result of a function or system failure internal to the person (e.g., cardiovascular and musculoskeletal diseases) and injuries that are more psychological in nature, such as work-related mental-health disorders. The omitted category is accidental injuries.

Independent Variables

We have four categories of independent variables. The first includes work demands (work hours and work schedule), the second includes family demands (spouse's work hours, number of children, and the age of youngest child), the third includes resources (core self-evaluations, marriage, income and work tenure), and the last includes demographics (sex, race/ethnicity, and age). We also include a *Time* variable.

Work demands

Work hours. These are the number of weekly work hours reported by the respondent. We also included work hours squared to model non-linear effects of work hours but found no statistically significant non-linear effects (not presented).

Irregular shifts. Respondents reported whether they worked a regular day shift (= 0) or any other type of irregular shift (rotating, irregular, night shift, other; = 1).

Family demands

Spouse work hours. These are the number of weekly work hours by the spouse as reported by the respondent. For respondents with no spouse, or a spouse who is not working, we coded a spouse's work hours as 0.

Number of children. This is the number of biological or adopted children age 18 years old and younger living with the respondent in the same household.

Children age 5 and younger. This is coded as 1 for respondents who have at least one biological or adopted child 5 years old or younger living with them in the same household; otherwise it is coded as 0.

Resources

Core self-evaluations. To measure CSE, we used the same 12 items from the NLSY79 as those in the study by Judge and Hurst (2008). Because CSE first appeared in an empirical paper in 1998, the NLSY79 does not contain a direct measure of CSE but rather a measure that is similar to the one later utilized by the Judge, Erez, Bono, and Thoresen (2003) Core Self-Evaluations Scale (CSES). Two items measure locus of control (e.g., "I have little control over the things that happen to me"); 5 items measure self-esteem (e.g., "I feel that I am a person of worth, on an equal basis with others"); 2 items measure neuroticism (e.g., "I've been depressed"), and 3 items measure self-efficacy (e.g., "What happens to me is my own doing"). Validation of this CSE measure is further detailed in Judge and Hurst (2008).

Income. This is the annual income from work as reported by the respondent. For ease of interpretation, we divided the reported income by $10,000. Income is reported in real U.S. dollars (CPI adjusted to 2012).

Tenure in weeks. This is the number of weeks the respondent has been working in their current job.

Marital status. This is coded as 1 for married and 0 for unmarried.

Control variables

Time. This is coded as 0 for 1988; 1 for 1989; 2 for 1990; 3 for 1991; 4 for 1992; 6 for 1994 and onwards with year 2000 coded as 12.

Demographics. The following variables were included: sex (female = 1, male = 0); age in 2000 (last year of the data); race/ethnicity (Black, Hispanic, and White, with White being the omitted category). We do not record age for every year because such variables will be identical to the time variable.

Industry. All models include industry controls to account for higher rates of work injuries in specific industries (e.g., transportation and construction). The omitted category is public administration.

Analytical Approach

Multilevel logistic regression is used to analyze the data. The nested nature of the repeated measures in the longitudinal data, where the same variables are measured multiple times by the same individuals (Agresti, 2000), lends itself to such analyses. Level 1 time-varying variables in our data are work hours, irregular shifts, number of children, age of the youngest child (< 5), spouse's work hours, tenure, income ($10,000), marital status, and work injury. These variables change over time at the within-subject level. Level 2 variables (between-subject level) are demographic variables (e.g., age in 2000, gender, ethnicity), industry, core self-evaluation, and grouped variables of the same as those used in level 1 analyses (e.g., work hours). The outcome of interest for this study is work injury as a dichotomous variable; this criterion is predicted by a linear combination of the within- and between-subject level predictors indirectly through the natural logarithm of the odds of work injury against no work injury. Specifically, the outcome variable in this study is

$$Y_{ij} = \ln\ (p^{k}{}_{ij}/p^{0}{}_{ij}), \qquad (1)$$

where *i* represents the time reported by *j* subject (*i* = 1-9); $p^{k}{}_{ij}$ is the probability of experiencing a work injury for an i_{th} subject at $_{\text{j}}$th time point; $p^{0}{}_{ij}$ is the probability of not experiencing a work injury for an i_{th} subject at $_{\text{j}}$th time point. PROC GLIMMIX (generalized mixed model) with Laplace estimation provided by SAS 9.3 was used to analyze data to achieve more efficient and unbiased estimation as suggested by Snijders and Bosker (2011). Hierarchical generalized linear modeling with repeated-measure provides robust parameter estimates, even with missing data (Raudenbush & Bryk, 2002; Ployhart, Holtz, & Bliese, 2002).

We begin with a fully unconditional model (FUM, or the null model), where only the outcome variable is included. We calculated the intraclass correlation coefficient (ICC; Snijders & Bosker, 2012, p. 305) to partition within- and between-subject variance, which justifies the use of multilevel modeling for the data with enough strength of the within-group interdependence (ICC = .754). The models used in the first stage are as follows:

Level 1 (within-subject level) model:

$$Y_{ij} = \ln\ (p^{k}_{ij}/p^{0}_{ij}) = \beta^{k}_{0j} \quad (2)$$

Level 2 (between-subject level) model:

$$\beta^{k}_{0j} = \Upsilon^{k}_{00} + u^{k}_{0j} \quad (3)$$

where β^{k}_{0j} represents the intercept for subject j; Υ^{k}_{00} is the mean of intercepts across all subjects; u^{k}_{0j} is the random variation of the intercepts across subjects. This random effect is assumed to be normally distributed with the mean of zero ($u^{k}_{0j} \sim N\ (0, \tau_{0}^{2})$). The estimate of between-subject variance of the intercepts (u^{k}_{0j}) is found to have a meaningful difference from zero, indicating that subjects differ in their probability of experiencing a work injury. Therefore, we could proceed with multilevel analysis methods.

Next, we ran an unconditional growth model to examine the effect of time on work injury at within-subject level (Table 2, Model 1). Model 2 further includes demographics (age, gender, Black, and Hispanic) and six industry dummy variables in reference to public administration industry as between-subject level predictors in addition to the time predictor. Subsequently, we proceed to add subsets of predictors to test the hypothesized fixed effects of work and family demands. We continue with a model that takes into account the additional effects of work and family demands on work injury in Model 3 and Model 4, where both within- and between-subject level fixed effects are estimated. Only the fixed effects of predictors are tested, since no particular hypothesis was made for the random effects. Lastly, our final model (Table 2, Model 5) extends to work and family resources (within- and between-subject level) and personal resources (between-subject level) demonstrating a superior model fit to those used previously. Because we did not hypothesize slopes to vary across individuals, the only random effect in our model is the random variation (u^k_{0j}) of the intercepts across subjects (β^k_{0j}). The final model with all predictors is described with the following equations:

Level 1 (within-subject level) model:

$$Y_{ij} = \ln\ (p^k_{ij}/p^0_{ij}) = \beta^k_{0j} + \beta_{1j}\ (Time) + \beta_{2j}\ (Work\ hours) + \beta_{3j}\ (Irregular\ shift) + \beta_{4j}\ (Number\ of\ children) + \beta_{5j}\ (Child\ younger\ than\ 5) + \beta_{6j}\ (Spouse\ work\ hours) + \beta_{7j}\ (Tenure) + \beta_{8j}\ (Income) + \beta_{9j}\ (Married) \quad (4)$$

Level 2 (between-subject level) model:

$$\beta^k_{0j} = \Upsilon^k_{00} + \Upsilon_{01}\ (Age\ in\ 2000) + \Upsilon_{02}\ (Female) + \Upsilon_{03}\ (Black) + \Upsilon_{04}\ (Hispanic) + \Upsilon_{05}\ (Work\ hours) + \Upsilon_{06}\ (Irregular\ shift) + \Upsilon_{07}\ (Number\ of\ children) + \Upsilon_{08}\ (Child\ younger\ than\ 5) + \Upsilon_{09}\ (Spouse\ work\ hours) + \Upsilon_{010}\ (Tenure) + \Upsilon_{012}\ (Income) + \Upsilon_{013}\ (Married) + \Upsilon_{014}\ (CSE) + u^k_{0j} \quad (5)$$

where the different industries were controlled in the multilevel analyses using six dummy variables at between-subject level.

We also ran a separate set of analyses for the same multilevel logistic models using only accidental work injuries as the outcome variable, which excludes functional and mental-health related work injuries. The results are presented in Table 3.

Results

Predicting work injuries

Descriptive statistics and correlations between the study's variables are presented in Table 1. Below-diagonal correlation coefficients include all observations. Correlations above-diagonal were calculated after averaging time-varying variables within-person (for a similar approach, see Judge & Livingston, 2008). Based on the above-diagonal correlations that are more conservative, we observe a positive relationship between work hours and irregular shifts and work injury (r = .03, p < .05 for both). Surprisingly, two of the family demands–having a young child at home and a spouse's work hours–show negative associations with work injuries (r = -.03, p < .05 and r = -.04, p < .05 respectively). All work and family resources, except tenure, are negatively and significantly associated with work injuries (r = -.04, p < .05 for income; r = -.03, p < .05 for marriage; and, r = -.03, p < .05 for CSE).

Table 1: Descriptive Statistics and Correlations among Study Variables

	Study variable	*M*	*SD*	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	Time	8.73	2.52		.01	.00	-.01	.00	.01	-.01	.02*	-.03*	.01	.03*	.02*	.01	.00	.01
2	Age (1988)	26.66	2.26	-.01		.02	.00	-.01	.00	.00	.07*	-.29*	.00	.15*	.06*	.03*	.15*	.01
3	Female	.53	.50	.00	.01		.09*	.00	-.41*	-.05*	.07*	-.23*	.18*	-.08*	-.35*	-.21*	-.08*	-.04*
4	Black	.27	.45	.00	-.01	.10*		-.31*	-.08*	-.01	.00	-.11*	-.17*	-.09*	-.16*	-.31*	-.05*	-.01
5	Hispanic	.20	.40	.00	-.02*	-.01	-.31*		.00	-.04*	.10*	.01	-.01	-.02*	-.05*	.03*	-.14*	.02
6	Work hours	41.89	9.58	.04*	.00	-.35*	-.05*	.01		.11*	-.03*	.10*	-.13*	.07*	.37*	.08*	.08*	.03*
7	Irregular shift	.13	.34	-.02*	.00	-.03*	.00	-.03*	.07*		.00	-.01	-.03*	-.05*	.03*	-.01	.02	.03*
8	#. of child	2.06	.96	.03*	.04*	-.04*	.03*	.08*	.00	.02		-.03*	.02	.03*	-.04*	.19*	-.03*	.01
9	Young child	.45	.50	-.24*	-.22*	-.19*	-.09*	.01	.04*	.00	.09*		.04*	.03*	.23*	.16*	.07*	-.03*
10	Spouse hours	27.47	21.26	-.01*	-.01	.14*	-.12*	-.01	-.10*	-.02	-.04*	.04*		.07*	-.04*	.54*	.09*	-.04*
11	Tenure	297.31	271.04	.15*	.14*	-.09*	-.07*	-.02	.06*	-.04*	.00	-.01	.03*		.27*	.19*	.11*	-.01
12	Income	3.04	2.69	.21*	.06*	-.33*	-.13*	-.04*	.30*	.01	-.02	.11*	-.07*	.26*		.25*	.30*	-.04*
13	Married	.75	.43	-.01	.02	-.27*	-.27*	.01	.08*	.00	.10*	.17*	.47*	.13*	.20*		.14*	-.03*
14	CSE	3.17	.36	.01	.16*	-.07*	-.05*	-.14*	.06*	.01	-.03*	.04*	.07*	.09*	.26*	.12*		-.03*
15	Work injury	.08	.26	.00	.00	-.04*	-.01	.02	.04*	.02	.02	-.03*	-.02*	-.01	-.04*	-.02*	-.03*	

* $p < .01$; $N = 11574$; below-diagonal coefficients are total correlations (not accounting for repeated observations); above-diagonal values are sample weighted between individual correlations (correlations between-person based on within-person mean of each variable; for a similar approach see Judge and Livingston, 2008).

Table 2 presents the results of the multilevel logistic regression analyses for testing Hypotheses 1, 2, and 3. Model 1 presents the effect of time on work injuries. As shown, time alone (which in this analyses can also be interpreted as getting older) does not influence the probability of getting injured in the workplace ($\beta = .02$, $p > .10$). In Model 2, between-subject level demographic variables are added (age in 2000, gender, and race/ethnicity), as well as industry controls. The effect of gender is significantly negative, indicating that women have a lower probability of experiencing workplace injuries than men ($\beta = .24$, $p < .10$). As might be expected, individuals who work in some industries (transportation and manufacturing) are more likely to suffer from a workplace injury. In Model 3, work demands were added to the model (work hours and irregular shifts) to test Hypothesis 1a. The results show that work hours do not predict the occurrence of work injuries at either of the within- nor between-subject levels; our findings show that individuals who work irregular shifts are more likely to suffer from work injuries than individuals who work regular shifts (between-person). Specifically, irregular shifts, compared to a regular day shift, increase the probability of getting injured by 58.4%. However, there is no statistically significant within-subject level relationship between shift schedule and work injuries.

Model 4 further introduces family demands to the analyses to test Hypothesis 1b. The number of children, children at home age 5 or younger, and a spouse's work hours were added to the model. Interestingly, the effect of gender becomes non-statistically significant once we account for these family demands; and, a person's age in 2000 becomes a statistically significant predictor of the probability of getting injured at work ($\beta = .09$, $p < .05$) such that older workers are more likely to experience workplace injuries. In addition, the respondent's work hours as a level-1 predictor have a positive, statistically-significant relationship with workplace injuries ($\beta =$

.02, $p < .05$), suggesting that a within-subject increase in work hours is related to a higher probability of workplace injuries. We estimate that an increase of one work hour per week is associated with a 2% increase in the probability of getting injured on the job. Among the family demand variables, the number of children and the presence of a child 5 years old or younger at the between-subject level is not associated with workplace injuries, although a spouse's work hours are significantly associated with them ($\beta = -.02$, $p < .01$). This indicates that individuals with spouses who work more hours are less likely to suffer from workplace injuries. Shifting to the within-subject effect of family demands on workplace injuries, we find that, contrary to our expectations, having a child age 5 or younger at home reduces the probability of getting injured ($\beta = -.36$, $p < .05$); our estimate of this 'protective' effect amounts to a 30.2% reduction in injury risk. As expected, a spouse's work hours are positively related to the probability of workplace injury ($\beta = .01$, $p < .01$); we estimate that a within-subject increase of one hour in a spouse's work time per week is associated with a 1% increase in the probability of getting injured at work.

To test Hypotheses 2a, 2b and 3, we estimate in Model 5 the effect of work and family resources (tenure, income, and marital status) and individual resources (CSE) on workplace injuries. We find no association between a within-subject change in resources and workplace injuries. Shifting to the between-subject results, we find that income has a negative relationship with the probability of workplace injuries ($\beta = -.21$, $p < .01$); moreover, a $10,000 increase in annual income is associated with an 18.9% decrease in the probability of suffering a workplace injury. We also find that CSE is, as expected, negatively associated with the probability of suffering a workplace injury ($\beta = -.29$, $p < .10$). Individuals with a CSE that is one unit higher have 25.2% lower probability of getting injured at work. We do not find significant between-subject effects for tenure or marital status.

Table 2: Multilevel Logistic Regression of the Effects of Work-Family Demands and Resources on Work Injuries

	Model 1 (Time)			Model 2 (Demographics/Industry)			Model 3 (Work Demands)			Model 4 (Family Demands)			Model 5 (Resources)		
Predictor (fixed effects)	Estimate (*β*)	*SE*	Odd ratio	Estimate (*β*)	*SE*	Odd ratio	Estimate (*β*)	*SE*	Odd ratio	Estimate (*β*)	*SE*	Odd ratio	Estimate (*β*)	*SE*	Odd ratio
Level 1 predictors															
Intercept	-6.37**	.23	-	-7.04**	.74	-	-3.73**	.61	-	-9.74**	1.17	-	-2.00*	.97	-
Time	.02	.01	1.023	.02	.01	1.020	.01	.01	1.010	.03	.02	1.030	-.02	.02	.980
Work hours							.01	.01	1.010	.02*	.01	1.020	.01†	.01	1.010
Irregular Shift							-.06	.13	.942	-.02	.20	.980	-.01	.19	.990
Num. of children										.14	.12	.150	.10	.11	1.105
Child under 5										-.36*	.17	.698	-.29†	.16	.748
Spouse work hours										.01**	.00	1.010	.01*	.00	1.010
Tenure													.00	.00	1.000
Income													.05	.05	1.051
Married													-.25	.23	.779
Level 2 predictors															
Age in 2000				.03	.03	1.030	-.03	.02	.970	.09*	.03	1.094	-.04	.03	.961
Female				-.24†	.12	.787	-.28**	.10	.756	-.10	.18	.905	-.50**	.15	.607
Black				-.14	.14	.869	-.19†	.11	.827	-.03	.18	.970	-.30*	.15	.741
Hispanic				.13	.15	1.139	.10	.12	1.105	.08	.20	1.083	.04	.15	1.041
Service[a]				.13	.16	1.139	.10	.13	1.105	.12	.21	1.127	.22	.17	1.247
Transportation[a]				.54**	.20	1.804	.39*	.17	1.477	.63*	.26	1.878	.43†	.22	1.537
Business[a]				-.03	.20	.970	.01	.17	1.010	-.27	.28	.763	-.03	.24	.970
Agriculture[a]				.21	.19	1.234	.38*	.16	1.462	.15	.26	1.162	.11	.22	1.116
Sales[a]				.10	.16	1.105	.13	.14	1.139	.09	.21	1.094	.04	.18	1.041
Manufacturing[a]				.31†	.16	1.363	.33*	.13	1.391	.29	.21	1.336	.22	.17	1.246
Work hours							-.00	.01	1.000	.00	.01	1.000	.01	.01	1.010
Irregular Shift							.46*	.21	1.584	.42	.33	1.522	.29	.28	1.336
Num. of										-.05	.13	.951	-.00	.12	1.000

	Model 1 (Time)			Model 2 (Demographics/Industry)			Model 3 (Work Demands)			Model 4 (Family Demands)			Model 5 (Resources)		
Predictor (fixed effects)	Estimate (β)	*SE*	Odd ratio	Estimate (β)	*SE*	Odd ratio	Estimate (β)	*SE*	Odd ratio	Estimate (β)	*SE*	Odd ratio	Estimate (β)	*SE*	Odd ratio
children															
Child under 5										.11	.26	1.116	-.25	.22	.779
Spouse work hours										-.02**	.00	.980	-.01*	.01	.990
Tenure													-.00	.00	1.000
Income ($10,000)													-.21**	.00	.811
Married													.11	.07	1.116
CSE													-.29†	.17	.748
Goodness-of-fit															
Deviance	10,120.12			10,100.32			10,104.81			6,356.97			5,741.40		
AIC	10,126.12			10,126.32			10,138.81			6,402.97			5,801.40		
BIC	10,147.16			10,217.48			10,258.00			6,556.11			5,999.32		

Note. *N* = 11574~20573 (XXX individuals). [a]Industry control variables are dummy coded in contrast to a reference category (public administration industry); service = entertainment services, personal service, professional services, finance, insurance, and real estate industry; transportation = transportation, communications, and other public utilities related industry; business = business and repair services industry; agriculture = agriculture, forestry, fisheries, mining, and construction industry; sales = wholesale and retail trade industry; manufacture = manufacturing industry.
† $p < .10$; * $p < .05$; ** $p < .01$

Testing different types of injuries

Table 3 presents the results for testing hypotheses 4 and 5. For all models, only individuals who were injured and reported details about their type of injury were included. Model 1 presents the effect of time on the probability of suffering from an accidental work injury compared to non-accidental injury. As can be seen, time (a person getting older) is significantly related to the type of workplace injury that can occur; with age, the probability of accidental injuries, compared to non-accidental injuries, decreases. In Model 2 we added our demographic and industry controls. As can be seen, none of the demographic variables are significantly related to the type of work injury; whereas–and as expected–individuals who work in transportation, manufacturing, and agriculture are more likely to suffer from accidental work injuries. In Model 3, we added work and family demands to the model. We find no between-subject associations between work and family demands and the type of workplace injury. At the within-subject level, we find that having one additional child is associated with an increased probability of suffering from a workplace injury (β = .30, $p < .10$) whereas having a child age 5 and under is associated with a lower probability of suffering from a workplace injury (β = -.58, $p < .05$). Finally, in Model 5 we add work and family resources (tenure, income, and marriage) as well as individual resources (CSE) to the model. We only find a statistically significant effect for marital status. Individuals who are married are more likely to suffer from an accidental injury (β = 2.46, $p < .01$). However, getting married (changing status from being non-married to married) is associated with a reduced probability of suffering an accidental injury at work (β = -2.21, $p < .01$).

Table 3: Results Examining the Effects of Work-Family Demand/Resource on Accidental Injuries at Workplace

	Model 1 (Time)			Model 2 (Demographics/Industry)			Model 3 (Work and Family Demands)			Model 5 (Resources)		
Predictor (fixed effects)	Estimate (*β*)	*SE*	Odd ratio	Estimate (*β*)	*SE*	Odd ratio	Estimate (*β*)	*SE*	Odd ratio	Estimate (*β*)	*SE*	Odd ratio
Level 1 predictors												
Intercept	-6.06**	.22	-	-7.04**	1.12	-	-9.53**	1.82	-	-6.13**	1.97	-
Time	-.27**	.02	.763	-.27**	.02	.763	-.30**	.04	.741	-.33**	.04	.719
Work hours							.03**	.01	1.030	.03†	.01	1.030
Irregular Shift							-.34	.31	.712	-1.54**	.35	.214
Num. of children							.30†	.18	1.350	.69**	.20	1.994
Child under 5							-.58*	.27	.560	-.58*	.28	.560
Spouse work hours							.01	.01	1.010	.02**	.00	1.020
Tenure										-.00	.00	1.000
Income										.08	.10	1.083
Married										-2.21**	.45	.110
Level 2 predictors												
Age in 2000				.03	.04	1.030	.09†	.06	1.094	-.00	.06	1.000
Female				-.26	.20	.771	-.12	.29	.887	-.32	.31	.726
Black				-.09	.22	.914	.09	.29	1.094	.22	.30	1.246
Hispanic				.08	.24	1.083	.11	.32	1.116	.36	.31	1.433
Service[a]				.35	.25	1.419	.40	.33	1.492	.19	.33	1.210
Transportation[a]				.81**	.30	2.248	.97*	.40	2.638	.37	.42	1.447
Business[a]				-.09	.32	.914	-.51	.47	.600	-1.09	.54	.336
Agriculture[a]				.57*	.29	1.768	.72†	.40	2.054	.70†	.39	2.014
Sales[a]				.26	.26	1.297	.27	.35	1.310	-.13	.36	.878
Manufacturing[a]				.48†	.25	1.616	.26	.34	1.297	-.19	.35	.827
Work hours							-.02	.02	.980	-.02	.02	.980
Irregular Shift							.54	.52	1.716	2.52**	.49	12.429
Num. of children							-.24	.21	.787	-.74**	.23	.478
Child under 5							.41	.43	1.507	.41	.44	1.507
Spouse work hours							-.01	.01	.990	-.02	.01	.980
Tenure										.00	.00	1.000
Income ($10,000)										-.18	.12	.825

	Model 1 (Time)			Model 2 (Demographics/Industry)			Model 3 (Work and Family Demands)			Model 5 (Resources)		
Predictor (fixed effects)	Estimate (β)	*SE*	Odd ratio	Estimate (β)	*SE*	Odd ratio	Estimate (β)	*SE*	Odd ratio	Estimate (β)	*SE*	Odd ratio
Married										2.46**	.64	11.705
CSE										.10	.36	1.105
Goodness-of-fit												
Deviance	5,752.24			5,736.16			3,415.68			3,017.97		
AIC	5,758.24			5,762.16			3,461.68			3,077.97		
BIC	5,779.28			5,853.33			3,614.82			3,275.89		

Note. *N* = 11366~20236 (XXX individuals). [a]Industry control variables are dummy coded in contrast to a reference category (public administration industry); service = entertainment services, personal service, professional services, finance, insurance, and real estate industry; transportation = transportation, communications, and other public utilities related industry; business = business and repair services industry; agriculture = agriculture, forestry, fisheries, mining, and construction industry; sales = wholesale and retail trade industry; manufacture = manufacturing industry.

† $p < .10$; * $p < .05$; ** $p < .01$

Discussion

The present study suggests that the determinants of workplace injuries should be explored beyond the workplace and the individual levels, and that more detailed examinations of how family structure and resources can be used to determine or prevent the risks of workplace injury. Such research is important for several reasons: first, the separation of work and family is arguably an artificial notion, given the likelihood that individuals experience the reciprocal influences and dynamic interactions between family life and work life. The blurring of boundaries between work and family life, and the spillover between these two domains is frequent and influential. Second, while research has been devoted to the cross-domain relationship between work and family, most has focused on perceptions and attitudes (e.g., work-family conflict and job satisfaction) and less has examined behavioral outcomes (Frone, 1998). Third, work injuries are destructive to an individual's health and financial wellbeing, and understanding the complex system of factors that affect workplace injuries can greatly benefit individuals, families, organizations, and policymakers. In this study, we explore the role of work and family demands and resources in the occurrence of workplace injuries. We do so using a robust design that takes into account both within- and between-subject changes and differences, and revealing several intriguing findings that are discussed below.

Based on the job demands-job resources model (JD-R model; Bakker & Demerouti, 2007), previous literature mainly focused on work-related demands or resources when predicting work injuries. We extend the JD-R model to address the effects of family demands and resources as additional factors that should be taken into consideration when studying behavioral work outcomes, such as job injuries. In order to examine the relationship between work/family demands, resources, and workplace injuries, we took a multilevel approach using longitudinal data with nine waves over a 12-year period. The longitudinal design allows us to make stronger causal inferences about the relationship between demands, resources, and workplace injuries. Such a sample has its limitations in terms of measuring perceptions and attitudes, as well as important workplace characteristics; but it allows us, however, to overcome the flaws inherent to many studies about workplace injuries that remain limited in their ability to longitudinally observe a low-frequency outcome (e.g., e.g., Barling et al.,2003b; Frone, 1998; Zacharatos et al., 2005). This is important because health problems and workplace accidents can be the result of an accumulated influence of certain predictors (e.g., mounting work demands). Such multilevel analyses also allow us to partition within- and between-subject level effects that can have different factors of influence on the risk of work injuries. For example, for the same predictor, only one level of analyses may show a statistically significant effect on the outcome. In our final Model 5 (Table 2), the age of an individual worker's youngest child is statistically significant, but only when predicting work injuries at the within-subject level and not the between-subject level. Such findings suggest that having a child has a negative effect on the probability of workplace injuries although individuals with younger children are not more or less likely to have an injury at work. Moreover, the nature of the relationship may differ in direction as well. For example, we found a spouse's work hours to show the opposite direction of association, depending on the level of analysis. If a person's spouse increases his/her work hours year by year, there is an increased probability of getting injured at work (within-subject level effect), whereas individuals with spouses who work longer hours are less likely to get injured at work (between-subject level effect).

Other findings also illustrate the importance of performing both between- and within-subject analyses in order to understand behavioral work outcomes such as work injuries. We find that work hours do not predict between-subject differences in the probability of suffering from a workplace injury. This might indicate that most individuals are able to select work schedules that do not deplete their resources to the extent that enforced longer hours or undesired or irregular shift schedules will increase the probability of injury. However, we also find that work hours do predict workplace injuries within-subject, such that individuals who increase their work hours year-over-year are more likely to suffer from a work injury. The findings for working irregular shifts also demonstrate the importance of studying both between- and within-subject effects. When resources are excluded from the models, working irregular shifts substantially increases the probability of workplace injuries between-subjects, but not within-subject.

The importance of taking family factors into account when attempting to predict workplace behaviors is strongly supported by our findings. Having a young child at home decreases the probability of suffering a workplace injury within-subject, but not within-subjects. This might indicate that individuals who have a young child, either adopted or biological (the only way a within-person change in having young children can happen), will be concerned not only about their work role but will also aim to be more responsible at work, or refrain from certain risk-taking behaviors in order to avoid injury. It is also possible that having a newborn child at home provokes a spillover (e.g., Barnett, 1994) of safer behavior that starts from within the family unit and extends to safer behavior in the workplace. However, because there is no difference in the probability of workplace injuries between subjects who have a young child and those who do not, it seems that young children are not a primary cause of resource depletion and that individuals with young children devote themselves to safer behavior at work. A spouse's work hours are another family-level variable that affects the probability of workplace injury occurrence within-person. Interestingly, a spouse's work hours are positively associated with workplace injuries within-subject and negatively associated with workplace injuries between-subjects. This finding indicates that individuals with spouses who work more hours are less likely to be injured than individuals with spouses who work less hours; but at the same time, a within-subject increase in spousal work hours stretches an individual's resources and results in an increased probability of suffering from a workplace injury.

We find that work resources in the form of income, and individual resources in the form of CSE, reduce the probability of suffering from a workplace injury. Income might be a proxy to the how hazardous the work is, with the assumption that individuals in more hazardous jobs (e.g., transportation and construction) are likely to have lower incomes than individuals in less hazardous jobs (e.g., accountants). The CSE effect on work injuries reaffirms the important role that personality may have in the occurrence of workplace injuries. It seems that organizations that are plagued by workplace injuries may be able to reduce their frequency by using personality tests as one of the criteria in employee selection for hazardous jobs; or, perhaps, conducting personality tests and self-evaluations on throughout an employee's tenure at a job and as an employee moves between jobs. Given the negative relationship of CSE with work injuries, and positive relationship with job satisfaction and performance (Judge & Bono, 2001; Kacmar, Collins, Harris, & Judge, 2009), it seems prudent to use CSE as a selection tool.

Finally, we are unable to predict the specific types of injuries individuals may have suffered from in our data. This may be the result of a lack of refinement of the injury category, or the randomness of some workplace injuries, especially biological ones (e.g., illnesses that result from working conditions in coalmines). We call for future research to better differentiate between injuries that are preventable (e.g., enforcing proper training and conduct resulting in safer behavior), and injuries that may be more psychological in nature (e.g., mental illness), and injuries that are very hard to avoid or predict (e.g., violence inflicted against the individual at work).

Practical Implications

The theoretical and empirical contributions of our study may help to promote more effective human resources policies that can aim to prevent and reduce workplace injuries. For example, increasing work hours for employees may require a company or industry to invest a greater amount of attention to employee behaviors that promote safety and provide them with resources (e.g., more flexible scheduling) that would allow them to devote enough resources to accident prevention. On the other hand, hiring new employees instead of extending work hours of current employees may not require such policies. Working irregular shifts seems to have a strong, positive effect on workplace injuries between-subjects, but not within-subjects. As such, it is important to devote safety-promoting resources to employees who work irregular shifts. Finally, organizations should consider factors outside work, and especially related to the family. For example, if both spouses work at the same company or organization, demanding more from one spouse may affect behavioral work outcomes for the other spouse.

In order to help men and women in various occupations achieve greater work-life balance, policymakers should consider the spheres of influence in both work life, and personal and family life, in their efforts to improve the individual wellbeing of workers in different fields and professions. Our findings suggest that employee wellbeing is not only determined by the characteristics of the work required and the demands of the job; rather, a more holistic perception of individuals as they perform in different life domains may result in policies that address the complexity of human behavior. One of the ways in which policymakers can contribute to promoting productive employees and a safe, positive working environment is to enhance the resources that employees have available to them. For example, providing paid parental leave and paid leave that will allow employees to take care of dependents (e.g., a sick child) may contribute to healthier and more productive work environments in the long-term. Doing so may also reduce the exorbitant costs associated with financial compensation for injuries if workers have the option of taking short, paid leaves rather than be less productive, exhausted or under stress in the workplace, which can lead to further depletion of energy and resources needed to maintain adequate levels of safety.

Limitations and Future Directions

Although the current study makes an important contribution to the current literature, it is not without limitations. The first is the use of longitudinal data, which enables us to follow the same individuals over a 12-year period but limits our ability to test the mechanisms at play that may reduce workplace injuries, For example, while having a higher income reduced the probability of suffering from a workplace injury, it is unclear if this is a result of less hazardous jobs for individuals with higher pay, an ability to replenish resources and meet demands with more income (e.g., having more vacation time or hiring help for household work and childcare), or a combination of both. Second, we hypothesized the deterrent effect of CSE on work injuries as a personal resource. As mentioned, this construct is a composite of four sub-facets (self-esteem, self-efficacy, neuroticism, and locus of control); although we did find a statistically significant impact for CSE overall, facet-level predictive validities would allow more intuitive and practical inference and would be of advantage in providing more detail about CSE and its effects. However, we could not perform facet-level analyses, because the measurement of CSE in the data was limited and there were only a few items from each facet's comprehensive inventory. We are also unable to control for state-level factors (e.g., differences in work policies across U.S. states) that may play an important role in an employee's probability of having a workplace injury due to the general rarity of injuries overall and the constant change in work-family related policies (e.g., paid and unpaid leave) over time and in potentially different regions of the country. Finally, previous studies have shown that workplace injuries are underreported in many workplaces, and that underreporting varies across industries, occupations, and demographics (e.g., Azaroff, Levenstein, & Wegman, 2002; Fan, Bonauto, Foley, & Silverstein, 2006; Pransky, Snyder, Dembe, & Himmelstein, 1999; Probst, Brubaker, & Barsotti, 2008; Tucker, Diekrager, Turner, & Kelloway, 2014). Underreporting, especially of less severe work injuries, may result in our findings underestimating the true effect of work and family demands on injuries in the workplace. We call for future studies to expand upon our current findings and examine these important aspects of the demands and resources found within the work-family dyad, that, to date, remain largely unexplored.

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