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**Are workflow interruptions a hindrance stressor? The moderating effect of time-management skill**

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Abstract

Workflow interruptions are a pervasive job stressor detrimental to employee job performance and wellbeing. Previous studies noted that the detrimental effect was intervened by increased job demands (i.e., demand accumulation mechanism). Yet, little attention has been paid to employees' stressor appraisal, a critical mechanism of stress process from transactional perspective. Moreover, we lack of knowledge about what malleable, action-based coping strategies can reduce the negative effect of workflow interruptions. To address these limitations, we collected data from a sample of IT professionals using a 5-day daily diary design. With 330 daily observations from 75 employees, the findings revealed that by controlling for the mediating effect of time pressure (i.e., demand accumulation mechanism), hindrance appraisal mediated the negative relationship between workflow interruptions and task performance as well as the positive relationship between workflow interruptions and psychological distress. More importantly, time-management skill was found to buffer the relationship between workflow interruptions and hindrance appraisal through which it further weakens the relationship of workflow interruptions with task performance and with psychological distress. Theoretical contributions and practical implications are discussed.

*Keywords:* workflow interruptions, stressor appraisal, time-management skill, task performance, psychological distress.

Imagine the following scenario: an employee is working on a financial statement with massive items and numbers when a colleague suddenly walks in and requests this employee to process an urgent document. As a result, this employee has to put aside the financial statement and switch to the intrusive document. This scenario reflects the experience of workflow interruptions that refers to a temporary suspension in an employee's goal-directed behavior (Pachler et al., 2018). Workflow interruptions are frequent given the results of a large survey study that one-third of employees reported being interrupted multiple times at work on a daily basis (Boisard, Cartron, Gollac, Valeyre, & Besancon, 2003). By discontinuing task process and thwarting goal striving, workflow interruptions can lead up to a set of negative consequences such as emotional exhaustion, irritation, compromised performance, and even increased accidents and medication errors in health care (Baethge & Rigotti, 2013; Elfering, Grebner, & Ebener, 2015; Pachler et al., 2018). In short, workflow interruptions are a prevalent and severe job stressor that places employee job performance and wellbeing in jeopardy. To mitigate the unfavorable consequences, researchers have started to explore the mechanism underlying the negative effect of workflow interruptions as well as how employees can better adapt to and cope with this stressor.

In view of the literature, the current knowledge of workflow interruptions is constrained in two aspects. First, past research has proposed that workflow interruptions compromise employee work outcomes by increasing job demands (e.g., time pressure and cognitive demand) (Baethge & Rigotti, 2013). However, despite its consistency in mediating the effect of workflow interruptions on wellbeing, this demand accumulation mechanism failed to consistently mediate that on employee job performance (Baethge & Rigotti, 2013). Given this, the demand accumulation mechanism does not provide a full account for the detrimental effect of workflow

interruptions. On the other hand, past research has also concluded a few important factors that buffer the negative effect of workflow interruptions. However, the findings are limited to the situational variables (e.g., appreciation by supervisors, Stocker et al., 2018) or the trait-like variables (e.g., polychronicity, Pachler et al., 2018) that are either out of employees' control or stable over time. To reach a broader theoretical appeal and a better practical utility, it is necessary to explore malleable, action-based coping resources that can be mastered by employees regardless of certain traits and be deployed across various situations.

The current study seeks to resolve these two major limitations. First, we direct the focus from the demand accumulation mechanism to the stressor appraisal mechanism that highlights the personal implications, rather than merely the level, of a given stressor (Lazarus & Folkman, 1984). Transactional theory of stress (Lazarus & Folkman, 1984) and related research (e.g., Webster, Beehr, & Love, 2011) deem stressor appraisal the proximal predictor of stress reactions and a central mechanism transmitting the detrimental effect of stressors on psychological and behavioral consequences. Research further shows that the detrimental effect of job stressors on employee wellbeing and job performance becomes salient and consistent when stressor appraisal (e.g., hindrance appraisal) is considered (LePine, Zhang, Crawford, & Rich, 2016; Webster et al., 2011). Thus, the stressor appraisal mechanism may provide a clear account for why workflow interruptions jeopardize job performance and wellbeing simultaneously. Given this, the present study examines the mediating effect of hindrance appraisal on the relationship of workflow interruptions with task performance and psychological distress. To further highlight the unique contribution and the theoretical robustness of the stressor appraisal mechanism, the present study also controls for the mediating effect of demand accumulation mechanism indicated by time pressure.

Second, we examine the effect of time-management skill, a malleable and action-based coping resource, in mitigating the detrimental effect of workflow interruptions. Transactional theory of stress suggests that a stressor will be less hindering to an individual who is capable of mastering over it, whereby he/she will be less likely to experience negative outcomes (Lazarus & Folkman, 1984; Liu & Li, 2018). A high level of time-management skill enables employees to effectively allocate and utilize time resources and swiftly resume the interrupted tasks (Macan, Shahani, Dipboye, & Phillips, 1990; Peeters & Rutte, 2005). We thus figure that time-management skill can buffer the relationship between workflow interruptions and hindrance appraisal, and in turn weakens the indirect effect of workflow interruptions on task performance and psychological distress. On the other hand, workflow interruptions are dynamic and fluctuate at daily level (Pachler et al., 2018; Stocker et al., 2018). Therefore, we use a 5-day daily diary design to test the mediating effect of daily hindrance appraisal on the daily workflow interruption-outcome relationships and investigate how time-management skill, a person level variable, affects the daily fluctuations.

Overall, the present study makes three contributions to the literature. First, from the stressor appraisal perspective, the present study follows the stressor appraisal perspective and elaborates why workflow interruptions are detrimental to both wellbeing and job performance simultaneously, a research question to which previous research has not provided an adequate answer. Thereby, we advance the theoretical understanding of the process linking workflow interruptions to unfavorable work outcomes. Second, the current study demonstrates the unique contribution of the stressor appraisal mechanism over the demand accumulation mechanism in explaining the effect of workflow interruptions, highlighting the theoretical utility of the stressor appraisal mechanism. Finally, we extend the knowledge of malleable, action-based coping

strategies to workflow interruptions by showing the buffering effect of time-management skill on the relationship between workflow interruptions and hindrance appraisal. Altogether, the study provides an essential framework for future studies to theorize the effect of workflow interruptions on employee outcomes and the coping strategies for employees to handle this stressor.

### **Workflow interruptions, hindrance appraisal, and employee outcomes**

Workflow interruptions are defined as a “temporary break in a goal-directed action” (p.417, Pachler et al., 2018). This line of research views workflow interruptions as a result of insertion of secondary, unplanned tasks during the course of completing a primary, planned task (Baethge & Rigotti, 2013; Brixey et al., 2007; Sonnentag, Reinecke, Mata, & Vorderer, 2018). These intrusive tasks may be delivered by an individual (e.g., supervisors or coworkers) or through medium (e.g., email or telephone) (Brixey et al., 2007). Certainly, workflow interruptions are also caused internally, for example, due to daydreaming (Brixey et al., 2007). Nevertheless, research that conceptualizes workflow interruptions as a situational stressor emphasizes on those externally generated because they are observable and represent situational events instead of one’s free choices (Baethge & Rigotti, 2013; Brixey et al., 2007; Elfering, Grebner, & Ebener, 2015; Sonnentag, Reinecke, Mata, & Vorderer, 2018; Stocker et al., 2018). Therefore, the current study focuses on workflow interruptions that are caused externally.

Workflow interruptions are reported to undermine employee task performance and increase psychological distress (Baethge & Rigotti, 2013; Brixey et al., 2007; Elfering, Grebner, & Ebener, 2015; Pachler et al., 2018; Stocker et al., 2018). Past research figures that these negative effects of workflow interruptions are transmitted through increased job demands such as time pressure or cognitive workload that consume personal resources and obstruct work goals.

However, the mediating effect of this demand accumulation mechanism on the workflow interruption-job performance relationship received mixed empirical support, indicating its theoretical inadequacy (Baethge & Rigotti, 2013). In fact, recent studies note that a high level of job demands does not necessarily translate into negative outcomes because some job demands (e.g., time pressure) may encompass motivating potential that allows for positive consequences (LePine, Podsakoff, & LePine, 2005; LePine et al., 2016).

Transactional theory of stress (Lazarus & Folkman, 1984) offers another insight into why workflow interruptions undermine employee outcomes. The theory endorses stressor appraisal as the central variable through which stressors affect individuals (Lazarus & Folkman, 1984). Stressor appraisal involves primary appraisal and secondary appraisal corresponding to different evaluation content. Primary appraisal concerns about the relational meaning of a stressor, namely the implications of a stressor for an individual's valued goals such as work accomplishment (Lazarus & Folkman, 1984; Liu & Li, 2018; Webster et al., 2011). For this reason, primary appraisal defines whether a job stressor is a challenge that facilitates an employee's achievement (i.e., challenge appraisal) or a hindrance that thwarts that outcome (i.e., hindrance appraisal) (Tuckey, Searle, Boyd, Winefield, & Winefield, 2015; Webster et al., 2011). Secondary appraisal, on the other hand, concerns about what an individual can do to address a stressor no matter it is a challenge or a hindrance (Lazarus & Folkman, 1984). Primary and secondary appraisals are distinct but related because secondary appraisal may influence the extent to which a stressor is appraised as challenging or hindering (i.e., primary appraisal) (Lazarus & Folkman, 1984; Liu & Li, 2018). Nevertheless, by defining the quality of a stressor (i.e., a challenge or a hindrance) as well as the nature of a stressful transaction to an individual, primary appraisal plays an essential role in shaping an individual's stress outcomes (LePine et al., 2016; Searle & Auton, 2015;

Webster et al., 2011). Previous research also paid exclusive attention to primary appraisal when studying the mediating effect of stressor appraisal on stressor-outcome relationships (LePine et al., 2016; Searle & Auton, 2015; Tuckey et al., 2015; Webster et al., 2011). Given this, we continue focusing on primary appraisal of workflow interruptions.

We propose that workflow interruptions should be positively related to hindrance appraisal. Transactional theory suggests that employees tend to appraise stressors (e.g., role stressors and organizational constraints) that potentially impede work completion and interfere with work goals as hindrances (LePine et al., 2016; Tuckey et al., 2015). Workflow interruptions are such a stressor for they suspend employees' goal-directed behaviors and disrupt employees' planned work progress (Baethge & Rigotti, 2013; Stocker et al., 2018). Research shows that workflow interruptions reduce employees' expectancy of work accomplishment and satisfaction with one's own performance, pertaining to the sense of hindrance (Pachler et al., 2018; Sonnentag, Reinecke, Mata, & Vorderer, 2018). It is thus conceivable that employees should make hindrance appraisal of workflow interruptions (Baethge, Riotti, & Roe, 2015; Elfering et al., 2015).

We acknowledge that employees can appraise a job stressor as a challenge and a hindrance at the same time (Prem, Ohly, Kubicek, & Korunka, 2017). However, such a dual-appraisal effect is plausible only for stressors with a potential to promote work accomplishment and personal development (e.g., workload or learning demand). This is because even if these stressors leave burden to employees, they also serve as a path to greater success on the condition of successful coping (LePine et al., 2005). To illustrate, a highly difficult project encompasses the risk of work completion as well as an opportunity toward a higher level of work accomplishment. However, even if an employee is able to successfully cope with workflow

interruptions, he/she can only complete assigned work tasks at best instead of obtaining extra gains. That is to say, workflow interruptions lack of motivating potential, which is the essential source of challenge appraisal. It is thus conceivable that workflow interruptions should be associated only with hindrance appraisal.

We argue that hindrance appraisal should mediate the relationship of workflow interruptions with both psychological distress and job performance. Research endorses hindrance appraisal as a key mechanism underlying the detrimental effect of job stressors on employee work outcomes (LePine et al., 2016; Webster et al., 2011). First, hindrance appraisal increases psychological distress because it occupies an individual's attention to the negative aspect of a stressor and then arouses negative psychological responses (Webster et al., 2011; Searle & Auton, 2015; Liu & Li, 2018). Supporting this notion, empirical studies have documented the positive relationships of hindrance appraisal with indicators of psychological distress, such as emotional exhaustion and negative emotions (Webster et al., 2011; Searle & Auton, 2015). Given this, workflow interruptions should be positively related to psychological distress via hindrance appraisal.

Additionally, hindrance appraisal can compromise task performance by evoking passive coping tendencies and constraining employees' cognitive-behavioral repertoires (Searle & Auton, 2015; LePine et al., 2016). Empirical studies have found that hindrance appraisal demotivates employees to do their work, lowers their task persistence, and hampers employees' optimal functioning (LePine et al., 2016; Liu & Li, 2018; Searle & Auton, 2015). Research thus concludes that employees' task performance will be compromised when they appraise a stressor as a hindrance (LePine et al., 2016). It is thus reasonable to posit that workflow interruptions should be negatively related to task performance via hindrance appraisal.

**Hypothesis 1a-1b.** Daily hindrance appraisals mediate the relationships of daily workflow interruptions with daily psychological distress (a) and task performance (b).

**The moderating effect of time-management skill on the workflow interruption-hindrance appraisal relationship**

When faced with a job stressor, some employees are less likely than others to make hindrance appraisal and then get less vulnerable to negative consequences (Lazarus & Folkman, 1984; LePine et al., 2016; Liu & Li, 2018). One's coping capabilities are a crucial factor that makes such a difference (Liu & Li, 2018). According to transactional theory of stress (Lazarus & Folkman, 1984), coping capabilities can influence an individual's sense of control over a stressful situation and the associated outcomes, which directly formulates personal implications of the stressful situation and consequently his/her stressor appraisal. In the face of a job stressor, employees who are capable of coping with it tend to view the stressor as controllable and believe the potential negative consequences are avoidable (Liu & Li, 2018). In this case, the stressor should appear less hindering to these employees. In contrast, employees who are incapable of coping with it are prone to view the situation as uncontrollable and believe the potential negative consequences are likely to occur (Liu & Li, 2018). In this case, they tend to appraise the stressor as more hindering.

We figure that time-management skill is a valuable and effective coping resource in the context of workflow interruptions. By definition, time-management skill reflects a set of behaviors towards an effective use of time conducive to task completion and goal attainment (Rapp, Bachrach, & Rapp, 2013). It entails prioritizing work goals, planning work tasks, and monitoring goal progress (Peeters & Rutte, 2005). Employees with superior time-management skill are believed to manage time resources and goal progress more effectively than those with

poor time-management skill (Eerde, 2003; Häfner & Stock, 2010; Macan, 1994). Unlike personality traits that are stable over time, time-management skill is a malleable, action-based coping resource that can be mastered and developed. Both environmental and personal factors can strengthen time-management skill (Aeon & Aguinis, 2017). For instance, organizational climate of honoring punctuality and deadline can foster an employee's time-management skill (Schriber & Gutek, 1987). People's belief in their ability to control time (i.e. temporal self-efficacy) can facilitate their time-management skill (Macan, Shahani, Dipboye, & Phillips, 1990). Empirical studies have consistently demonstrated that training programs or related interventions can improve employees' time-management skill (Claessens, Van Eerde, Rutte, & Roe, 2007).

In view of transactional theory of stress (Lazarus & Folkman, 1984) and the adaptive characteristics of time-management skill, we propose that time-management skill should reduce employees' hindrance appraisal of workflow interruptions by strengthening the belief that workflow interruptions are manageable and work incompleteness is avoidable. Workflow interruptions consume time resources, making it tough for employees to complete the planned work. Research acknowledges that employees with superior time-management skill are better able to allocate time-based resources, especially when these resources go scarce (e.g., facing a tight schedule) (Macan, Shahani, Dipboye, & Phillips, 1990; Peeters & Rutte, 2005). These employees are skillful in prioritizing important work tasks and making a thorough to-do list, which helps complete work tasks according to the realistic condition (Rapp et al., 2013). As being able to compensate the time consumed by workflow interruptions, employees with superior time-management skill should perceive the situation as more controllable and less hindering. In addition, employees with superior time-management skill are also prone to

carefully monitor their goal progress and swiftly shift their attention between the primary task and intrusive activities (Rapp et al., 2013). These employees are thus better able to resume their interrupted tasks, move forward and secure their goal progress. This also suggests that they should perceive workflow interruptions as less hindering to task completion and work goals. In contrast, employees with poor time-management skill tend to lose their pace, get consumed by interruptive situations, and disengage from goal striving in the face of workflow interruptions. Since the situation becomes less manageable and more obstructive to their work goals, a higher level of hindrance appraisal is aroused. Taken together, we propose the following hypothesis:

**Hypothesis 2.** Employees' time-management skill moderates the relationship between workflow interruptions and hindrance appraisal such that the relationship is weaker for employees with higher levels of time-management skill.

### **The Moderated Mediation Model**

Taken the propositions together, we argue that by attenuating the workflow interruption-hindrance appraisal relationship, time-management skill can further weaken the indirect relationship between workflow interruptions and task performance, and between workflow interruptions and psychological distress via hindrance appraisal. Workflow interruptions are less hindering to employees with superior time-management skill; hence, these employees are less likely to experience psychological distress, and their task performance is less likely to be compromised. In contrast, employees with poor time-management skill are more likely to appraise workflow interruption as hindering, and in turn experience higher levels of psychological distress and a bigger impediment to task performance. Our research model is presented in Figure 1.

**Hypothesis 3a-3b.** Employee time-management skill moderates the indirect relationship

of workflow interruption with task performance (a) and psychological distress (b) via hindrance appraisal such that the relationships are weaker for employees with higher levels of time-management skill.

### **The Current Study**

Workflow interruptions fluctuate within employees on a daily basis (Pachler et al., 2018; Sonnentag et al., 2018; Stocker et al., 2018). Furthermore, stressor appraisal is inherently transient and dynamic, warranting the real-time assessment for sake of measurement accuracy. Considering these points, we deem it appropriate to assess the variables and test the model at the daily level to reveal the dynamic fluctuations in workflow interruptions, hindrance appraisal and employee work outcomes. We conceptualize time-management skill as a malleable individual difference variable that influences the aforementioned daily fluctuations. Thus, we specify time-management skill at the person-level and investigate the cross-level interaction between daily workflow interruptions and time-management skill in predicting daily hindrance appraisal. In the present study, we use a 5-day daily diary design to test the hypotheses. Additionally, past research endorsed time pressure as a mechanism underlying the relationship between workflow interruptions and work outcomes (i.e., the demand accumulation mechanism) (Baethge & Rigotti, 2013; Stocker et al., 2018). To demonstrate the unique contribution of the stressor appraisal mechanism and fortify the theoretical validity of our research model, we also assess daily time pressure and control it as the competing mediator.

## **Method**

### **Participants and Procedures**

The participants in the current study were IT professionals working at a large IT consulting firm located in Southern China. With the help of the organization, we sent the study

invitation email to 109 employees, and 92 employees agreed to participate (84%). The data was collected in two phases. First, employees received a general survey assessing demographic variables and time-management skill. One week later, employees received two daily surveys per day across five consecutive workdays. We separated daily surveys into two parts in order to reflect the temporal order indicated by our hypotheses, reduce common method bias and allow for testing a lagged effect noted by transactional theory (Podsakoff, MacKeznie, Lee, & Podsakoff, 2003). The employees received the first daily survey assessing workflow interruptions and hindrance appraisal before their lunch break (i.e. 12:00 pm) and the second daily survey assessing daily psychological distress and task performance at the end of each workday (i.e. 5:00 pm). The employees were instructed to fill out each survey within three hours. To be included in the final sample, the employees had to complete the general survey and respond to both daily surveys each day for a minimum of three days. This criterion yielded 330 daily observations from 75 employees. Each employee received approximately \$15 for participation. For the final sample, the average age was 37.00 (SD = .86), 65% were male, and the average job tenure was 13.84 in years (SD = 9.94).

### Measures

Unless otherwise noted, employees were instructed to answer each survey item on a 5-point likert scale from 1 (*strongly disagree*) to 5 (*strongly agree*). The scales were translated from English to Chinese through the process back-translation by research assistants fluent in both languages (Brislin, 1970). The Cronbach's Alpha ( $\alpha$ ) reported for each daily variable was averaged across five days.

**Workflow interruptions** were assessed using three items adapted from the Stress-Oriented Task Analysis (ISTA; Semmer, Zapf, & Dunckel, 1999) ( $\alpha = .87$ ). The items were

“How often has your work been interrupted by your colleagues today?”, “How often has your work been interrupted by your supervisor today (e.g., by questions)?”, and “How often has your work been interrupted because something important comes up?”. Response choices ranged from 1 (*never*) to 5 (*very often*).

**Hindrance appraisal** was assessed using the adapted version of the 3-item hindrance appraisals scale (LePine et al., 2016) ( $\alpha = .77$ ). One sample item was “In general, I feel that today’s job demands hinder my personal accomplishment”.

**Task performance** was assessed using three items adapted from the individual task proficiency scale developed by Griffin, Neal and Parker (2007) ( $\alpha = .83$ ). One sample item was “Today, I carried out the core parts of my job well”.

**Psychological distress** was assessed using five items adapted from the Kessler et al.’s (2002) psychological distress scale ( $\alpha = .93$ ). We modified the items to fit into daily work context. One sample item was “Today, my job made me feel irritable”.

**Time-management skill** was assessed as a between-person variable using the 10-item time-management behavior scale made by Peeters and Rutte (2005) ( $\alpha = .70$ ). One sample item was “How often do you review work activities?” Response choices ranged from 1 (*seldom*) to 5 (*very often*).

### **Control Variables**

Daily time pressure was assessed with the 3-item scale developed by Ohly and Fritz (2010) (e.g., “Today I need to work faster than usual to get my work done”) ( $\alpha = .84$ ). Response choices ranged from 1 (*strongly disagree*) to 5 (*strongly agree*). In our initial analysis, we also controlled for employee age, gender and job tenure, because past studies reported the effect of these variables on employee hindrance appraisal (Liu & Li, 2018), job performance (Lin, Ma,

Wang, & Wang, 2015) and psychological distress (Bradley, 2007). However, none of these demographic variables were significant in predicting any of the endogenous variables. Following Becker et al.'s (2016) recommendations, we excluded these demographic variables in our final analysis.

### **Analytical Strategy**

Since daily data was nested within people, we calculated the percentage of within-person variance over total variance to check if the daily variables had sufficient within-person variance. The results show that for the daily variables, 25% to 80% of their variance was attributed to within-person level, indicating the sufficiency of within-person variance. This justifies the use of multi-level modeling to test the hypotheses. Following the procedures recommended by Muller, Judd, and Yzerbyt (2005), we tested a first-stage moderated mediation model using a two-level path modeling with Mplus 7.2. Daily workflow interruptions were centered using group-mean and time-management skill was centered using grand-mean prior to analysis in order to estimate the cross-level interaction effect (Enders & Tofighi, 2007). The proposed indirect and conditional indirect effects were examined using Bayesian estimation that relies less on *p*-value and provides greater flexibility in estimating complex error structures (Kim, Park, & Headrick, 2018). The indirect effect is significant when the 95% of confidence interval (CI) excludes zero. Note that the mediating effect of daily time pressure was assessed and controlled in the analysis. Though we did not establish a hypothesis for the moderating effect of time-management skill on the relationship between workflow interruptions and daily time pressure, this moderating effect was also estimated and controlled for.

## **Results**

Descriptive statistics and correlations among study variables are presented in Table 1. We

summarized the results of path coefficients in Table 2. We proposed that with the effect of time pressure being controlled for, hindrance appraisal should mediate the relationship between workflow interruptions and task performance, and between workflow interruptions and psychological distress. The results showed that workflow interruptions were positively related to hindrance appraisal ( $\gamma = .14, p = .004$ ), and hindrance appraisal was negatively related to daily task performance ( $\gamma = -.25, p = .01$ ) and positively related to daily psychological distress ( $\gamma = .20, p = .01$ ). Bayesian analysis showed that hindrance appraisal significantly mediated the negative relationship between workflow interruption and task performance ( $effect = -.04, CI95\% = [-.07, -.005]$ ) and the positive relationship of workflow interruption and psychological distress ( $effect = .03, CI95\% = [.003, .06]$ ). Hypothesis 1a and 1b were fully supported.

We further proposed that time-management skill should moderate the workflow interruption-hindrance appraisal relationship. Consistent with the hypothesis, time-management skill was found to significantly buffer the relationship between workflow interruptions and hindrance appraisal ( $\gamma = -.30, p = .01$ ). Figure 2 shows the pattern of the moderating effect. Simple slope analysis indicated that the workflow interruption-hindrance appraisal relationship was significant for employees low in time-management skill (-1SD) ( $simple\ slope = .25, p < .001$ ), but not for employees high in time-management skill (+1SD) ( $simple\ slope = .03, p = .65$ ). Hypothesis 2 was fully supported.

Finally, we argued that time-management skill should moderate the indirect relationship of workflow interruptions with task performance and with psychological distress via hindrance appraisal. Bayesian analysis showed that the indirect relationship between workflow interruptions and task performance via hindrance appraisal was significant for employees low in time-management skill (-1SD) ( $effect = -.06, CI95\% = [-.12, -.01]$ ), but not for those high in

time-management skill (+1SD) (effect =  $-.01$ ,  $CI95\% = [-.03, .03]$ ). Likewise, the indirect relationship between workflow interruptions and psychological distress via hindrance appraisal was also significant for employees low in time-management skill (-1SD) (effect =  $.05$ ,  $CI95\% = [.01, .11]$ ), but not for employees high in time-management skill (+1SD) (effect =  $.004$ ,  $CI95\% = [-.03, .04]$ ). Hypothesis 3a and 3b were fully supported.

### **Additional Analysis**

Although not proposed in the hypothesis, time-management skill was found to significantly buffer the positive relationship between workflow interruptions and time pressure ( $\gamma = -.20$ ,  $p = .004$ ) (Table 2) such that the relationship was significant for employees low in time-management skill (-1SD) (simple slope =  $.19$ ,  $p = .001$ ), but not for employees high in time-management skill (+1SD) (simple slope =  $.05$ ,  $p = .50$ ). Additionally, time-management skill did not significantly moderate the direct relationship between workflow interruptions and task performance ( $\gamma = .14$ ,  $p = .32$ ) or between workflow interruptions and psychological distress ( $\gamma = -.13$ ,  $p = .62$ ).

To further assess the robustness of hindrance appraisal in explaining the effect of workflow interruptions and to address the impact of common method bias to a higher extent, we re-tested the mediating effect of hindrance appraisal by controlling for the effect of task performance and psychological distress of the previous day. The mediating effect of time-pressure was retained and controlled for. The results show that workflow interruptions were positively related to hindrance appraisal ( $\gamma = .19$ ,  $p = .01$ ). Hindrance appraisal was negatively related to daily task performance ( $\gamma = -.19$ ,  $p = .02$ ) with task performance of the previous day being controlled for. Hindrance appraisal was also positively related to daily psychological distress ( $\gamma = .20$ ,  $p = .02$ ) with psychological distress of the previous day being controlled for.

Bayesian analysis supported the mediating effect of hindrance appraisal on the relationship between workflow interruptions and task performance ( $effect = -.04$ ,  $CI95\% = [-.07, -.001]$ ) and between workflow interruptions and psychological distress ( $effect = .04$ ,  $CI95\% = [.004, .08]$ ). The mediating effect of hindrance appraisal was again fully supported with this approach.

### **Discussion**

In a sample of IT professionals, the current study supported the mediating effect of hindrance appraisal on the relationship of workflow interruptions with task performance and psychological distress at daily level. Time-management skill as a person level variable was found to buffer the relationship between workflow interruptions and hindrance appraisal. On this basis, time-management skill further weakened the indirect relationship of workflow interruption with task performance and with psychological distress via hindrance appraisal. By controlling for the effect of daily time pressure as the competing mediator, the research findings revealed the unique contribution of hindrance appraisal. To summarize, hindrance appraisal is an important mechanism intervening the effect of workflow interruptions on task performance and psychological distress. Time-management skill is a protective variable that mitigates the negative impact of workflow interruptions through reducing hindrance appraisal.

### **Theoretical Implications**

Previous research argues that workflow interruptions compromise employee wellbeing and job performance by increasing job demands such as time pressure (Baethge & Rigotti, 2013). However, the demand accumulation mechanism reveals its limitation in accounting for the detrimental effect of workflow interruptions on employee job performance (Baethge & Rigotti, 2013). We complemented this literature by demonstrating the utility of the stressor appraisal mechanism. Hindrance appraisal was found to intervene the detrimental effect of workflow

interruptions on both psychological distress and task performance even with the mediating effect of time pressure (i.e., the demand accumulation mechanism) being controlled for. The mediating effect of hindrance appraisal was further supported by controlling for the baseline level of the two outcome variables assessed on the previous day. The findings highlight the validity and robustness of the stressor appraisal mechanism in accounting for the negative effect of workflow interruptions. It thus complements the demand accumulation mechanism. Thus, the detrimental effect of workflow interruptions can be better understood via hindrance appraisal. On the other hand, the findings lend an extra support to the transactional theory of stress regarding stressor appraisal as a major mechanism linking stressors to stress outcomes (Lazarus & Folkman, 1984; Webster et al., 2011). Although previous studies have highlighted this point, we provided more promising evidence showing the incremental validity of stressor appraisal above the demand accumulation mechanism in predicting stress outcomes.

More importantly, we advance the knowledge of coping with workflow interruptions by revealing the buffering effect of time-management skill on the relationship between workflow interruptions and hindrance appraisal. Previous studies concluded a few situational variables and personal traits that buffer the detrimental effect of workflow interruptions (Pachler et al., 2018; Stocker et al., 2018). But the theoretical and practical utility was constrained in that these factors are beyond the control of employees or comparably stable overtime. Furthermore, this stream of research did not elaborate the process through which these factors take effect on reducing the detrimental effect of workflow interruptions. Time-management skill is a malleable and action-based coping resource, which can be developed with practice (Pachler et al., 2018). It helps sustain wellbeing and job performance in the context of workflow interruptions even for the employees without access to the situational resources or without the adaptive traits. Moreover,

according to the findings, the protective effect of time-management skill occurs through reducing hindrance appraisal, which enriches the knowledge of the coping process. In this present study, workflow interruptions were a hindrance stressor only for employees with poor time-management skill. The additional analysis further reveals that time-management skill as a coping resource also modifies the demand accumulation mechanism for it buffered the workflow interruption-time pressure relationship, which further highlight its positivity in the case of workflow interruptions. In short, we endorse time-management skill as a valuable coping resource that can modify the personal implications of workflow interruptions and protect employee wellbeing and job performance.

The current study also contributes to the time-management skill literature and the stressor appraisal research by demonstrating the implication of time-management skill for stressor appraisal. Research concluding the stress shielding effect of time-management skill primarily emphasized on the behavioral implications of time-management skill. That is, time-management skill reduces unfavorable stress outcomes by stimulating adaptive coping behaviors (Rapp et al., 2013). Yet, we demonstrate that time-management skill also alters stress process by modifying negative stressor appraisal, which is more cognitive-oriented. What's more, research investigating personal characteristics that influence stressor appraisal of stressors pays more attention to personal traits (Kilby, Scherman, & Wuthrich, 2018). This line of research seems to suggest that an individual's stressor appraisal mechanism is relatively stable, consistent and fixed over time with little within-person variations. To date, few studies have been done to investigate how malleable skills influence stressor appraisal. We complement this body of knowledge by showing the significance of skills in stressor appraisal. We imply that although an individual is predisposed to appraise a given stressor in certain ways due to his/her personal traits, his/her

appraisal pattern can still be changed by developing coping skills relevant to a given situation. In short, considering malleable skills along with other personal factors will provide a more comprehensive delineation of how an individual appraises stressors.

### **Practical Implications**

We suggest that organizations should recognize the issues of workflow interruptions and take effective measures to eliminate interruptions at the very first place. Organizations should build a channel for employees to report hindrance stressors such as workflow interruptions, so that they could identify and reduce these unnecessary stressors in time. Furthermore, organizations should also grant employees “silent hours” on the daily basis when employees are allowed to concentrate on their tasks at hand and are discouraged to interrupt others (Pachler et al., 2018; Sonnentag et al., 2018).

The current study claims that workflow interruptions undermine employee task performance and wellbeing by evoking hindrance appraisal. Fortunately, time-management skill as an internal coping resource can lessen employees’ hindrance appraisal for workflow interruptions and in turn reduce the negative impact. Time-management skill also helps reduce time pressure following workflow interruptions. Therefore, it is imperative for organizations to strengthen employee time-management skill especially under frequent interruptions. One way to reach this goal is implementing training programs such as time-management workshop. Häfner and Stock (2010), for instance, developed time-management intervention based on theoretical notions and empirical findings. The first phase of the intervention is *self-reflection* wherein employees can be asked to note down all the current tasks and reflect upon them in terms of their importance, asking questions such as “which tasks are the most important ones and why?”. The second phase includes *defining tangible and proximal goals* for the important tasks. This

involves detailed description of what needs to be delivered by the defined deadlines. The third phase involves *brainstorming strategies* to achieve the goals while considering potential obstacles. The next phase, which includes *daily planning*, asks employees to create a specific schedule for each task. The schedule should consider factors such as the length of time required to complete the task, the place where it will be accomplished, and so on. The final phase of the time-management intervention involves *monitoring the task completion*. These techniques are also useful in gaining control over time at work and helpful in dealing with unexpected interruptions (Häfner & Stock, 2010). This intervention has been adapted by other studies and has been shown to improve participants' time-management skill and reduce time-related stress (e.g., Häfner, Stock, & Oberst, 2015; Häfner, Stock, Pinneker, & Ströhle, 2009). It is also important for employees to practice these time-management skills at everyday work so that they can better internalize the skill and make it automatic.

### **Limitations and Future Directions**

The current study has a few limitations. First, we are unable to make causal conclusions given the study design. To strengthen the causal conclusion, future studies are recommended to replicate this study by a full experimental design. Second, the self-report performance is vulnerable to rating biases (e.g., social desirability or self-defensiveness). Nevertheless, research has supported the convergent validity between self-and others-report of task performance (Conway & Huffcutt, 1997). Given our study design, self-rating may be more credible than other-rating (e.g., supervisor-rating) because it is unfeasible for coworkers or supervisors to rate focal employees' performance on a daily basis (Pachler et al., 2018). Another limitation of this study is the narrow scope of interruptive events in the daily measure. In order to keep daily measures as short as possible to ensure sufficient responses (Pachler et al., 2018; Sonnentag et

al., 2018), we only included three items for daily workflow interruptions. But interruptions at work can stem from other sources (e.g., by a phone call, a text message from families, etc.). It is possible that interruptions from certain sources may be more hindering than those from other sources. Future studies are recommended to further specify the different sources of workflow interruptions and examine if they affect employee outcomes differently<sup>1</sup>. Additionally, the current study does not extend to the coping process by modeling employees' specific coping behaviors that manage either the workflow interruptions (i.e., problem-focused coping) or their reactions (i.e., emotion-focused coping). It will be intuitive to examine if and how time-management skill affects the coping process. Future studies may fill this gap by considering the coping mechanism as well.

We come up with a few interesting questions for future studies to explore. Recent studies suggest that in addition to stressor appraisal, self-regulation process is another important route through which job stressors affect work outcomes (Zhang, Zhang, Ng, & Lam, 2019). On top of investigating how employees appraise workflow interruptions, it will be insightful to examine how workflow interruptions influence employees' self-regulation, such as promotion focus and prevention focus, and how the different regulation strategies make a difference in employee outcomes. Perhaps, workflow interruptions may inhibit promotion focus (i.e., tendencies toward approaching personal gains) but elicit prevention focus (i.e., tendencies toward avoiding personal loss). Since self-regulation has significant implications for emotion, motivation and behavior (Koopmann et al., 2019; Zhang, Zhang, Ng, & Lam, 2019), it may offer extra insights in explaining employees' psychological and behavioral responses to workflow interruptions. Furthermore, the current study focused on work outcomes of those being interrupted. Yet, job

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<sup>1</sup> We thank the anonymous reviewer for this insightful comment.

stressors may have a cross-over effect impacting other people at work (Westman, Bakker, Roziner, & Sonnentag, 2011). In this case, it will be interesting to examine how one's own experience of interruptions affects his/her peers through interpersonal behaviors. For instance, it is possible that due to the temporary suspension in goal-striving, an employee being interrupted may feel irritable and becomes uncivil to other employees, which evokes negative experiences of others.

All in all, the current study confirmed that hindrance appraisal mediated the relationship of workflow interruptions with task performance and with psychological distress at daily level and supported the buffering role of time-management skill on workflow interruption-hindrance appraisal relationship.

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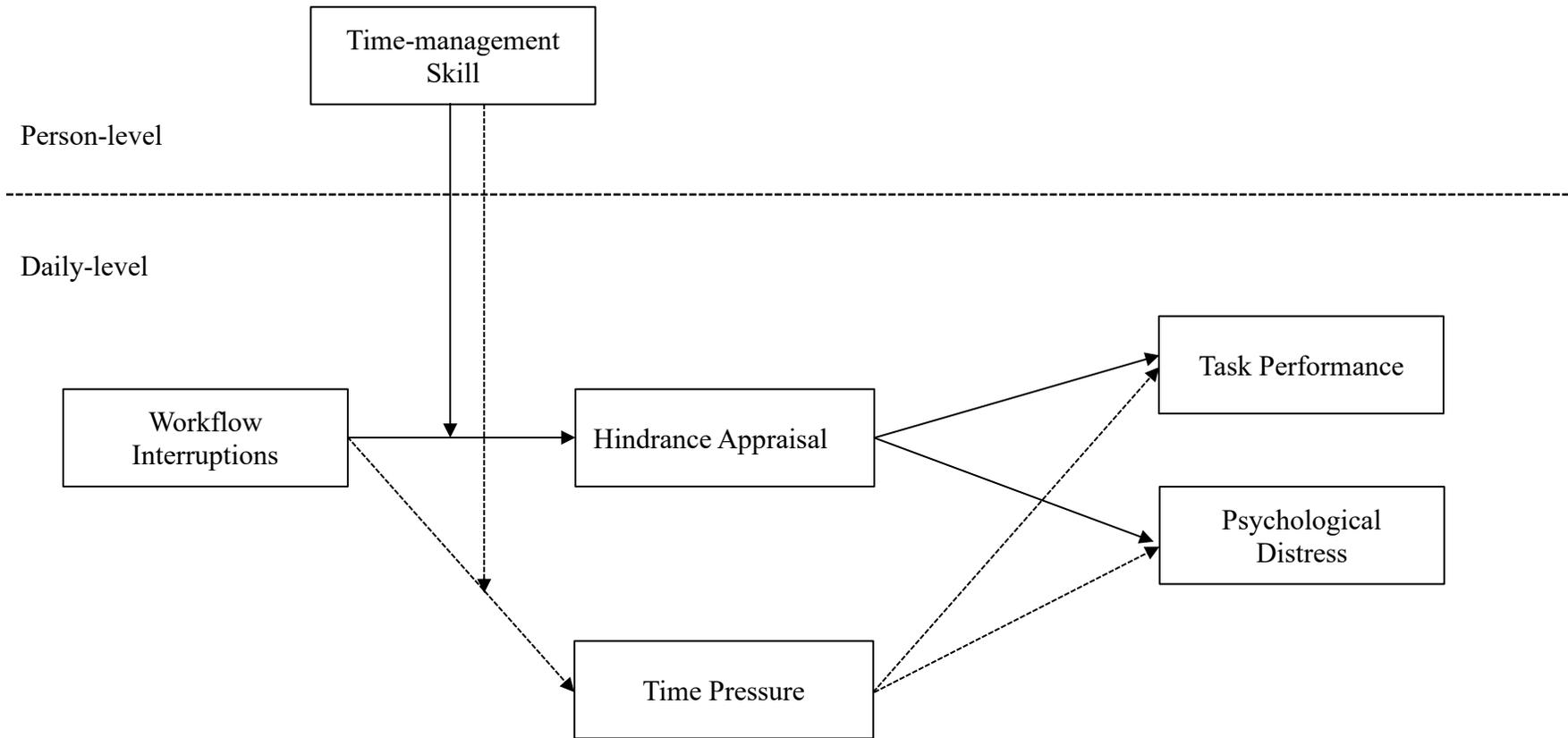
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Figure 1. The Hypothesized Model



Note: The solid lines are the hypothesized paths; The dashed lines are the unhypothesized paths controlled and estimated.

Table 1.

*Descriptive Statistics, Reliabilities, and Correlations for Study Variables*

Variables	<i>M</i>	<i>SD</i>	<i>ICC</i>	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>	<i>6</i>	<i>7</i>	<i>8</i>	<i>9</i>
1. Age	37.00	8.60	-	-								
2. Gender	1.14	.49	-	-.11*	-							
3. Job Tenure in Year	13.84	9.94	-	.98**	-.10	-						
4. Time-management skills	3.65	.36	-	.06	.09	.07	<i>(.70)</i>					
5. Time pressure	3.25	.69	.37	.08	-.02	.09	.15*	<i>(.84)</i>				
6. Workflow interruption	2.97	.96	.59	.07	-.01	.06	-.09	.28**	<i>(.87)</i>			
7. Hindrance appraisal	2.67	.74	.61	.11*	-.06	.12*	-.18**	.34**	.48**	<i>(.77)</i>		
8. Task performance	3.84	.55	.20	.05	.00	.04	.24**	.11*	-.11*	-.26**	<i>(.83)</i>	
9. Psychological distress	1.90	.95	.75	.14*	-.01	.10	-.22**	.20**	.41***	.55**	-.17**	<i>(.93)</i>

*Note.*  $N_{within} = 330$ ,  $N_{between} = 75$ . *M* = mean, *SD* = standard deviation. *ICC* = intra-class correlation coefficient. Internal consistency reliabilities are in italics and appear on the diagonal within prentices. The Cronbach’s alpha for daily variables are averaged across five work days. \*  $p < .05$ , \*\*  $p < .01$ , \*\*\*  $p < .001$ .

Table 2.

*Summary of Path Coefficients of The Two-level Path Model.*

	Endogenous Variables			
	Time Pressure	Hindrance appraisal	Task performance	Psychological distress
Constant	3.23 (.06) **	2.67 (.07) **	3.84 (.04) **	1.95 (.10) **
Workflow interruptions	.12 (.07)	.14 (.05) **	.02 (.05)	.12 (.05) *
Time-management skill	.22 (.16)	-.32 (.17)		
Interaction product	-.20 (.02) **	-.30 (.12) *		
Time Pressure (Controlled Mediator)			.16 (.05) *	.02 (.07)
Hindrance appraisal (Mediator)			-.25 (.09) *	.20 (.08) *
<i>Pseudo-R</i> <sup>2</sup>	.04	.10	.32	.05

*Note:*  $N_{within} = 330$ ,  $N_{between} = 75$ . \*  $p < .05$ , \*\*  $p < .01$ . The level-1 predictors were group-mean centered and the level-2 predictor was grand-mean centered prior to analysis. The coefficient estimates were unstandardized and the standard error for coefficient was in the parentheses.

Figure 2. The Moderating Effect of Time-Management Skills (TMS) on Workflow Interruption-Hindrances Appraisal Relationship

