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Investigating the impact of IT-mediated information interruption on emotional exhaustion in the workplace

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ABSTRACT

Information technology-mediated interruptions have become widespread and ubiquitous in the workplace. However, our understanding of how these interruptions and individuals' interruption processing mechanism impact individuals' performance, especially psychological performance, is still limited. Leveraging Conservation of Resources Theory, this study focused on two types of IT-mediated information interruptions (congruent and incongruent) and examined the moderating effects of different process mechanisms on the relationship between information interruptions and individuals' interruption overload. A multi-methods research design was conducted in this study: a qualitative study with 20 interviews in Study 1 and a quantitative study with 345 surveys in Study 2. The results show a positive indirect effect of IT-mediated information interruption on emotional exhaustion through interruption overload. Results also review the moderation effects of different processing mechanisms. The findings of this study advance the current understanding of the "dark side" of online information behavior. Additionally, this study provides practical and theoretical implications for both employers and employees on how to process IT-mediated information interruptions in the workplace.

1. Introduction

Information technology-enabled connectivity can offer communication flexibility among people and has gradually become the main channels that people communicate with each other (Dennis, Fuller, & Valacich, 2008). While the widespread of IT (information technology)-mediated channels bring convenience to people, it also produces some "dark side" and negative consequences such as frequent information interruptions, especially in the workplace (Gupta, Li, & Sharda, 2013; Addas & Pinsonneault, 2015). Due to the nature of the technical devices, IT-mediated information interruptions can occur anywhere and at any possible time (Chen & Karahanna, 2014). Although some of the IT-mediated information interruptions are minuscule and take only a few minutes, as they become more frequent and their numbers accumulate, they may cost a high price (Chen & Karahanna, 2018). IT-mediated information interruptions have been ubiquitous in the workplace. According to the results of a survey conducted by Udemy (2019)[1], nearly 3 quarters of the participants admit to feeling interrupted during the work time, with 16 percent being "almost always distracted". Moreover, individuals may get interrupted every 11 minutes. Fried (2005) argued that it takes about 8 minutes for an individual to get into a creative state without interruptions, however, once being interrupted, the time spent on returning to the

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[1] https://www.entrepreneur.com/article/330196

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primary task will be at least 25 minutes (Mark et al., 2005). More specifically, the average times of viewing the phones in one day is 52, the figure of e-mails being sent daily in the world is about 333 billion.

Previous studies have classified IT-mediated interruption types into several categories. Addas and Pinsonneault (2015) argued that IT-mediated interruptions are IT-based external information that breaks individuals' continuity of primary activities, such as e-mail, instant messaging and so on. For example, instant messages, e-mail or PC-pop-up messages during work time can be interruptive and distract individuals' attention from the primary ongoing work tasks (Salvucci & Bogunovich, 2010). Time and energy are important resources for individuals in the workplace (Chen & Karahanna, 2018). The distraction from primary works to new-coming interruptions will lead to the loss of these valuable resources. Consequently, psychological and behavior stress will arise from these resource losses (Hobfoll, 1989). Given the growing focus on the interruptions enabled by new types of communication technologies and the technology-mediated work environment, more studies are needed to investigate the impact of IT-mediated information interruptions so that we can understand how to manage interruptions in the workplace (Chen & Karahanna, 2018).

IT-mediated interruptions have been investigated in previous studies as a key challenge that will hinder individuals' performance in the workplace (Perlow, 1998). Most of these studies focus on the impact of IT-mediated interruptions on individuals' work performance (Bailey & Konstan, 2006; Monk, Trafton, & Boehm-Davis, 2008; Dodhia & Dismukes, 2009; Clapp, Rubens, Sabharwal & Gazzaley, 2011) and have examined a limited perspective of individuals' psychological performance derived from the interruptions. However, there is evidence that a high level of psychological stress for employees will lead to their overload, demotivation and even health impairment (Rohrmann, Bechtoldt, Hopp, Hodapp, & Zapf, 2011). In addition, from a practical point of view, a dozen of employees committed suicide in Foxconn in 2010, some of which committed suicide as a result of high levels of psychological pressure during work time. Such accidents and employees' psychological performance have now aroused global attention. Therefore, it is of vital importance to shift our attention from merely individuals' work performance to their psychological state, which plays a critical role in promoting individuals' work efficiency and general performance.

Among all the categories of psychological performance, emotional exhaustion is a widely studied one in relevant literature (Leiter & Maslach, 1988; Chen & Karahanna, 2018). Emotional exhaustion is defined as the "central quality of burnout and the most obvious manifestation of this complex syndrome" by Maslach, Schaufeli and Leiter (2001, p.402). In the workplace context, emotional exhaustion can be regarded as a form of psychological costs derived from the IT-mediated information interruptions (Kong, Ho, & Garg, 2018). For example, frequent information interruptions during work time will lead to a high level of work exhaustion, thus resulting in fatigue, frustration, wearing out, being used up in work (Maslach & Jackson, 1981) and even loss of concern and trust in other employees (Maslach, 1982). In contrast with the state of emotional exhaustion, emotional stability can serve as valuable resources that help individuals to reduce emotional exhaustion (Penney, Hunter, & Perry, 2011) and promote their performance during work time (Lin, Li, Yan, & Turel, 2018). As a result, we intend to focus on the effects of IT-mediated information interruptions on individuals' degree of emotional exhaustion.

When being interrupted, individuals will choose different processing mechanisms and reallocate their resources between the primary and new tasks. For instance, some employees are easily interrupted and tend to deal with the new-coming information interruptions immediately with their primary tasks unfinished, which is defined as the "*preemption processing*" (Kirmeyer, 1988). While others tend to address the tasks in sequence and continue with the primary tasks, which is defined as the "*sequential processing*" (Kirmeyer, 1988). Despite the growing focus on the IT-mediated interruptions in individuals' work, very little is known on the effects of different interruptions processing mechanisms.

To address the above gaps both in practice and in relevant research, we intend to examine the following research questions in this study:

Research question 1 (RQ1):*What are the specific types of IT-mediated information interruptions, individuals' processing mechanisms and subsequent outcomes in the workplace?*
Research question 2 (RQ2):*How do IT-mediated information interruptions affect individual's emotional exhaustion?*
Research question 3 (RQ3):*How do individual's different processing mechanisms moderate the relationship between information interruption and interruption overload?*

In order to answer the above research questions, we draw upon Conservation of Resources Theory (COR) to understand individuals' dynamic allocation of resources between their primary tasks and IT-mediated information interruptions (Hobfoll, 1989). We focused on two types of IT-mediated information interruptions and included different processing mechanisms as moderators in this research. Using a multi-method research design, we developed the research model in Study 1 and conducted the hypotheses testing in Study 2. The findings can provide useful lens for us to understand the effect of IT-mediated information interruptions and interruptions management in the workplace.

The rest of this paper is structured as follows. In the second section, we provide the literature background of the research questions that we focused on. The third section describes the multi-methods research design, hypotheses development and details the data analysis including the qualitative and quantitative study. The fourth section concludes the summary of findings. The fifth section depicts the theoretical contribution and practical implication in this study. In the final section, we propose the limitations of this study as well as the suggestions for future research.

2. Literature review

We base our research model on Conservation of Resources Theory (COR) proposed by Hobfoll (1989). In the first section of the literature review, we elaborate the theoretical tenet of COR theory and the reason for choosing COR theory in this research context. In the second section, we provide a historical understanding of the impact of IT-mediated information interruption in the workplace. Specifically, we introduce two typical kinds of information interruption in this research and propose the research gaps in this field. In the third section, we distinguish between the different processing mechanisms when being interrupted. The impacts of different processing mechanisms are also elaborated.

2.1. Conservation of Resources Theory (COR)

Conservation of Resources Theory (COR) is a theory of stress, which is a major factor impacting peoples' work and lives (Hobfoll, 1989). COR theory (Hobfoll, 1989, p.513) is based on the postulation that "people strive to retain, protect, and build resources and that what is threatening to them is the potential or actual loss of these valued resources." Specifically, these resources include object resource (e.g., a home that provides shelter), conditions (e.g., marriage, tenure, and seniority), personal characteristics (e.g., self-esteem) (Grandey & Cropanzano, 1999) and energies (e.g., time, money, physical energy and mental energy). Among all these resources, time and energy are especially relevant to our investigation into the effects of IT-mediated information interruption in the workplace (Chen & Karahanna, 2018). According to COR, psychological and behavioral strains will arise from the loss of valued resources. Therefore, when confronted with intrinsic or extrinsic stress in the workplace, individuals will strive to minimize the loss of their resources.

We leverage COR theory to understand the psychological outcomes of individuals induced by the IT-mediated information interruption in the workplace to explain how these interruptions influence their interruption overload and emotional exhaustion. COR offers several insights that can support our theorizing. First, COR stipulates that time and energy are important resources not only in their intrinsic value but also their value in obtaining other kinds of resources (Hobfoll, 1989). Second, individuals will allocate their resources to minimize their resource losses when confronted with stress (Chen & Karahanna, 2018). From the perspective of COR, IT-mediated information interruption entails resources shifting from current work to other demands, which will eventually deplete individuals' resource reserves and lead to negative work and psychological outcomes. Therefore, given its emphasis on the importance of resources allocation in the different outcomes, we employ COR theory to explore the impact of IT-mediated information interruption in the workplace.

2.2. Impact of IT-mediated information interruption

We examined the existing literature on the impact of information technology mediated interruptions (e.g., instant messages, e-mail, PC-pop-up messages) to support this study (Marulanda-Carter & Jackson, 2012; Baethge & Rigotti, 2013; Gupta et al., 2013). Specifically, Addas and Pinsonneault (2018) distinguished the interruptions into two types: congruent interruptions and incongruent interruptions. Congruent interruptions refer to those relevant to or complementary to the ongoing activities or primary activities (Kluger & DeNisi, 1996; Addas & Pinsonneault, 2018). For example, congruent IT-mediated information interruptions for a salesperson can be the supplementary requirements of customers. By contrast, incongruent interruptions can be those interruptions that are not relevant to the primary activities and even divert attention away from ongoing activities. For example, the most frequently mentioned incongruent IT-mediated information interruptions in Study 1 are the Wechat messages regarding a family event or from a friend.

Specifically, we summarized several observations based on the review of relevant literature. First, most studies only investigated the direct negative effect of interruptions on individual outcomes, such as task-related errors (Bailey & Konstan, 2006), cognitive load (Adamczyk & Bailey, 2004), memory lapses (Dodhia & Dismukes, 2009; Clapp et al., 2011), delay of tasks (Monk et al., 2008) and so on. However, limited attention has been given to how the different interruption processing mechanisms can impact individuals' outcomes. Second, the review indicates that the two most frequently mentioned outcomes of interruptions are subjective overload (Mark, Gudith, & Klocke, 2008; Gupta et al., 2013; Galluch, Grover, & Thatcher, 2015) and task performance (Szalma, Hancock, Dember, & Warm, 2006; Hodgetts & Jones, 2006; Marulanda-Carter & Jackson, 2012). Early works on interruptions mostly focused on the effects on individual or group performance, while recent works have been gradually turning to the effects of interruptions on individuals' psychological outcomes. Third, most research on the interruptions is based on laboratory experiments that rely on the laboratory settings over a short period of time. Laboratory experiments can provide evidence on the causal relationships, however, they lack the realism of the workplace (Jenkins, Anderson, Vance, Kirwan, & Eargle, 2016).

To address the aforementioned research gaps, our objectives are as follows. First, we aim to explore the impacts of different processing mechanisms on the individual in the workplace, instead of only testing the impact of interruptions. Second, we mainly focus on individuals' psychological outcomes instead of task performance in this research. Third, to avoid the lack of realism of conducting lab experiments, we conduct the multimethod research to guarantee the realism of the research context.

2.3. Impacts of different processing mechanisms

According to COR theory, an individual may employ other resources (e.g., time, energy) to compensate for the resource loss (Hobfoll, 1989). In the workplace, an individual will choose different coping strategies and make decisions on the sequential order in which they address the new activities and primary activities when being interrupted. These processing strategies also deplete some other valuable resources. For example, choosing to attend to the new activity when interrupted will deplete the time and energy resources that should have been used in the primary activity. On the other hand, appropriate processing mechanisms of interruptions can lead to an increase in individuals' work or psychological outcomes via a positive mechanism. For example, Addas and Pinsonneault (2018) verified the positive relationship between the different processing mechanisms of e-mail interruptions and individuals' mindfulness in problem-solving.

Previous research has investigated several processing mechanisms of interruptions (Kirmeyer, 1988; Parkes, 1994; Basoglu, Fuller & Sweeney, 2009; Wajcman & Rose, 2011). The most frequently mentioned coping strategies were sequential processing, preemption and simultaneity. Sequential processing occurs when the primary activity is finished before the new activity begins when interrupted. Preemption occurs when the individual has to stop the primary activity and respond to the incoming demand immediately. Simultaneity occurs when the individual begins to attend to the incoming activity and primary activity simultaneously. However, sometimes the incoming activity may take priority and the primary activity will be delayed or left unfinished.

In this research context, we mainly focus on two types of processing mechanisms of the IT-mediated information interruptions: sequential processing and preemptive processing. Given the limited information processing capacity of the human brain (Lang, 2000), an information interruption will interfere with working memory (Clapp et al., 2011). Once the individuals are interrupted, it will take them nearly 25 minutes to get back to the primary work (Mark, Gonzalez & Harris, 2005; Chen & Karahanna, 2018). Consequently, choosing to attend to the interruptions with the primary task unfinished or keep on with the primary task can lead to different outcomes. We identify the influencing mechanism of IT-mediated information interruptions, interruption overload and emotional exhaustion in Figure 1.

3. Methodology

Our study employed a multimethod research design comprising a qualitative study and quantitative study in the context of workplace. We first interviewed 20 workers from different industries on IT-mediated information interruption that they experienced in the workplace. The interviews in the Study 1 provided qualitative data that enabled our conceptualization of the constructs and hypotheses development. Study 2 was based on a survey method and examined the impacts of incongruent and congruent IT-mediated information interruption on individuals' interruption overload and emotional exhaustion.

In sum, the multi-method research design fulfilled several purposes and leveraged the strengths of both qualitative study and quantitative study (Hua, Cheng, Hou, & Luo, 2019; Venkatesh, Brown, & Sullivan, 2016). Qualitative study can be used for exploratory research to generate new theoretical insights, develop a deep understanding into a phenomenon and hypotheses development. In contract, quantitative study has been used more for confirmatory research to test theories or causal relationships (Venkatesh, Brown, & Bala, 2013). Moreover, the multi-method research design can also help to triangulate and confirm the research findings and provide more evidence in the conclusions reached (Tashakkori, Teddlie, & Teddlie, 1998).

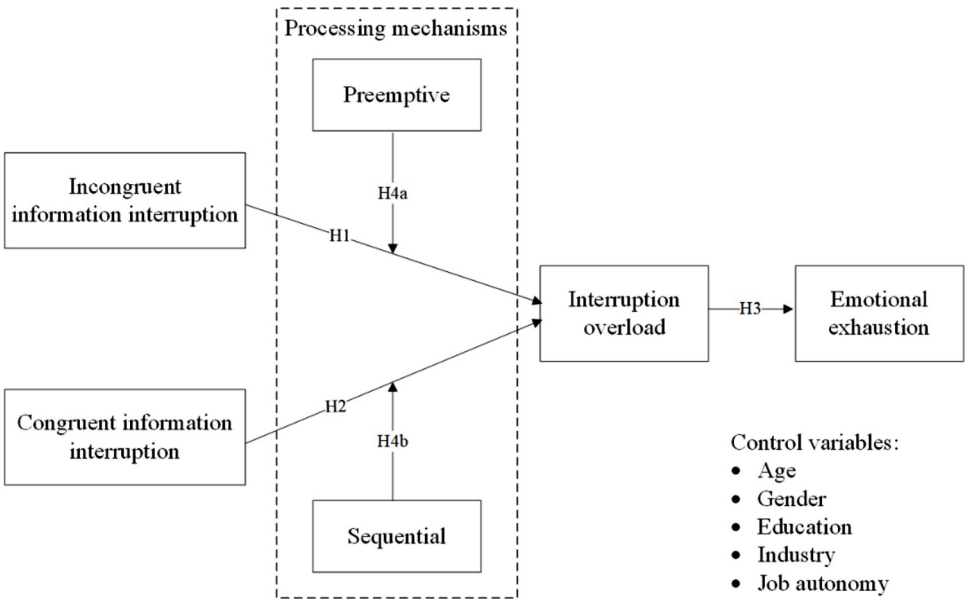

Fig. 1. A model of IT-mediated information interruptions and emotional exhaustion.

3.1. Study 1:Qualitative study

A qualitative study based on interviews was conducted in Study 1 to answer the first research question (RQ1): *What are the specific types of IT-mediated information interruptions, individuals' processing mechanisms and subsequent outcomes in the workplace?* To answer this research question, we conducted 20 semi-structured interviews with workers from different industries on their perception of IT-mediated information interruption during their work experience. Before the formal interview process, we conducted two interviews with the researchers in our group who had had work experience before and modified the interview guide following their suggestions. After that, we conducted the 20 semi-structured interviews with 20 employees from different industries. Specifically, 10 of the participants are male and 10 are female. They work in different industries, including construction (5%), transportation (10%), energy (5%), trade (15%), marketing (10%), finance (35%), real estate (5%) and IT (15%). Before conducting the formal interviews, the researchers were trained to respond to the answers properly to obtain more useful information (Eisenhardt, 1989). All the interviews were conducted face to face and lasted for more than 20 minutes, ensuring a 100 percent response rate. Then we recorded and transcribed all the interviews.

The interviews include questions that allow the interviewees to depict their general perception of IT-mediated information interruption in the workplace, how they dealt with the information interruptions and how the interruptions and different coping mechanisms impacted their psychological outcomes. Several open questions were also included in the interview. The interviews were all recorded and transcribed as soon as possible after each interview was conducted. In the data analysis process, we followed the established instructions for inductive research (Miles & Huberman, 1994). We iterated between the interview data and theory to clarify the specific constructs in this research context (Selander & Jarvenpaa, 2016). The three rounds of coding process in the data analysis is provided in Table 1.

Table 1
Three rounds of coding process

Illustrative quotes	Second order categories	Third order categories
"For example, the work leaders will assign you some related work (to the current work), this is congruent (congruent information interruption); when I am using a system for maintenance, the relevant manager may call me and tell me how to use it" (a1)	A1 Congruent IT-mediated information interruption	AA1 Type of IT-mediated information interruption
"Sometimes when I was doing something, my department leader would say that the font should be changed and more information should be added." (a2)		
"A WeChat message may come sometimes and tell you that current project may need to be modified. This kind of requirement (interruption) is very common." (a3)		
"When I'm at work, I have to use the web pages, some online ads and stuff will pop up, and even some phone calls." (a4)	A2 Incongruent IT-mediated information interruption	
"I always hear from harassing call about loan, buying a house and so on, these came suddenly and interrupted my job." (a5)		
"(Interruptions) Including messages from friends, family, WeChat text messages, taobao ads and some harassing phone calls. "(a6)		
"Sometimes I open up a browser and then a lot of ads and push will come up. Then I have to turn it off so that I can get back on with my work." (a7)		
"Work must be the first thing to do, because you are in a state of work, the interruption of information should be delayed." (a8)	A3 Sequential processing	AA2 Processing mechanisms
I will just keep doing what I was doing. (a9)		
"I basically did what I had planned to do, except that every once in a while there was something called a distraction and I have to do that first." (a10)		
"I will definitely deal with work-related tasks in my worktime." (a11)		
"When I'm in a continuous working state such as writing a report an article, and that kind of thing (interruption) will have a large impact. In that case, I will leave away the WeChat messages and so on." (a12)		
"Generally I will deal with the newcomers (interruption). This is the equivalent of interrupting your work, because you can't go on working unless you solve the problem." (a13)	A4 Preemptive processing	
"If the customer wants it right now, and sometimes I have to give it to him first, I will finish it as soon as possible, and then do what I was originally doing, and then try not to delay." (a14)		
"For example, if my boss tells me to do this (interruption) right away, what I have done before would be interrupted and then I will do it (interruption)." (a15)		
"It's a lot of pressure to keep getting new information interruptions." (a16)	A5 Interruption overload	AA3 Psychological outcomes
"There may be a lot of pressure, because some of the work needs to be done on time, and then you may have more work to do." (a17)		
"It (interruption) has been interrupting my progress, and I may have to work late to get my work finished, which can lead to an overload." (a18)		
"Sometimes it may be necessary to answer several phone calls or give him a refusal, which will have some impact on my emotion." (a19)	A6 Emotional exhaustion	
"When there are different opinions, my mind will be confused and tired." (a20)		
"In a word, the interruptions in the work time are always annoying and time-wasting." (a21)		
"Sometimes listening to what they say is also very upset, it will affect the mood of work and some negative energy will have an effect." (a22)		

In the first round of coding process, we began with our analysis with the analysis of all 20 interview transcripts to understand the themes and constructs raised by the interviewees and get a sense of their perception of the IT-mediated information interruptions in their work experience. We also triangulated each interview data with existing research (Samiee, 2010). Through the initial coding process, we noticed several major themes and extracted some illustrative quotes that conveyed the interviewees' ideas or perspectives when faced with IT-mediated information interruption during their work time. Some interviewees described the frequency of IT-mediated information interruption during work and talked about their consequent coping methods and outcomes of these interruptions. In this process, all the expressions that were related to their perceptions of IT-mediated information interruptions were marked with "(ax)".

In the second round of qualitative data analysis, we focused on the specific types on interruptions and interviewees' different response to the interruptions in the workplace. Based on the illustrative quotes yielded from the first round of coding process, we identified and redefined several major themes and constructs that helped to understand the impact of different interruptions on workers' behavior. Specifically, we also turned to Conservation of Resources Theory (COR) to understand the negative impacts of IT-mediated information interruption in the workplace. In this process, several key themes and constructs emerged and were marked as "(Ax)".

In the third round of data analysis, we attached more importance to the development of the core categories of interviewees' perception and expressions of IT-mediated information interruptions. The coding process yielded three core categories of workers' in the workplace and helped us understand the relationship between different constructs more deeply. The third order categories were marked as "(AAx)".

As highlighted in Table 1, the analysis of qualitative data yielded six key constructs grouped into three categories: (1) different types of IT-mediated information interruptions (e.g., congruent IT-mediated information interruption, incongruent IT-mediated information interruption), (2) workers' processing mechanisms on the interruptions (e.g., sequential processing, preemptive processing), (3) workers' psychological outcomes of the interruptions and processing (e.g., interruption overload, emotional exhaustion). The findings in Study 1 helped to verify the several key constructs of IT-mediated information interruptions in the workplace context. The interview data can also provide evidence on the hypothesis development in Study 2. Additionally, we iterated between the findings and theory to provide evidence on the conceptualization of constructs and hypotheses development.

3.2. Conceptual model and hypotheses development

Based on the constructs proposed in Study 1 and existing research, we can infer that individuals may be exposed to different types of IT-mediated information interruptions when performing their ongoing activities (Galluch et al., 2015; Addas & Pinsonneault, 2018). IT-mediated information interruptions in the workplace have been found to lead to several negative psychological or work outcomes (Adamczyk & Bailey, 2004; Bailey & Konstan, 2006; Dodhia & Dismukes, 2009; Clapp, Rubens et al., 2011). COR theory indicates that loss of resources in the workplace has important consequences on individual's work or psychology (Chen & Karahanna, 2018). However, appropriate processing mechanisms of individuals when interrupted can also compensate for the resource loss. Therefore, we intend to explain the multiple effects of IT-mediated information interruptions on individuals' psychological outcomes, involving the impacts of different processing mechanisms.

3.2.1. Effects of information interruption on psychological performance

According to COR, psychological or behavioral stress will arise when the demands are considered as exceeding ones' finite resources (Halbesleben & Wheeler, 2015). When being interrupted in the workplace, individual will have to transfer their finite personal resources (e.g., time, energy and attention) from one activity to another (Edwards & Rothbard, 2000). Mobilizing additional resources between activities have been found to increase cognitive load and reduce the opportunity to replenish these valuable resources (Zohar, 1999). For example, each new interruption in the workplace will push the individual to store and retrieve the new-coming task or information in their memory. With accumulative interruptions, individuals will have to mobilize different resources between the multiple interrupting stimuli, which will consequently increase their levels of stress, cognitive load and interruption load (Zohar, 1999; Baethge, Rigotti, & Roe, 2015). In this study, we defined interruption overload as the degree to which individuals have too much IT-mediated information interruptions to handle in their original or current activity at work. As is discussed in the previous literature review, we targeted two types of IT-mediated information interruptions in this study: incongruent IT-mediated information interruption and congruent IT-mediated information interruption. Congruence refers to the similarity between current work and new-coming interruptions (Edwards & Rothbard, 2000; Addas & Pinsonneault, 2018).

On the one hand, with repeated exposure to incongruent IT-mediated information interruption, individuals are likely to transfer to a new work state that distracts their attention from the current work state (Salvucci & Bogunovich, 2010), thus increase their level of overload of the interruptions. For example, one of our participants mentioned:

"I always hear from harassing call about loan, buying a house and so on, these came suddenly and interrupted my job." (a5)

On the other hand, some scholars argued that exposure to congruent IT-mediated information interruptions will lead to an informational gain that improves individuals' efficiency of decision making (Addas & Pinsonneault, 2015; Raabe, Frese, & Beehr, 2007). However, repeated exposure to IT-mediated information interruptions will still overwhelm individuals with information and increase individuals' stress and cognitive load, especially when the time pressure is high (Kluger & DeNisi, 1996). For example, some participants said that:

"Sometimes when I was doing something, my department leader would say that the font should be changed and more information should be added."

"A WeChat message may come sometimes and tell you that current project may need to be modified. This kind of requirement (interruption) is very common." (a3)

Existing studies have distinguished between congruent and incongruent interruption in several facets, such as the congruent/incongruent e-mail interruptions (Addas & Pinsonneault, 2018), their effects on the performance efficiency (Czerwinski, Cutrell, and Horvitz, 2000). While as we mainly focus on the effects of information interruption on the overload caused by the interruption. Action regulation theory (ART) is a widely used theory of interruptions in the work psychology field (Baethge & Rigotti, 2013). ART is concerned with the state when individuals have to regulate their actions frequently to cater for the external environment or conditions (Addas & Pinsonneault, 2018). For example, individuals will allocate their resources for their actions. Their performance will depend on whether they can successfully regulate their actions to achieve their goals (Frese, & Zapf, 1994; Raabe, Frese, & Beehr, 2007). Therefore, according to action regulation theory (ART), we can infer that all interruptions in the workplace can be considered as disruptive stimuli and will negatively impact the cognitive regulation on job (Baethge & Rigotti, 2013; Baethge et al., 2015). Therefore, the following hypotheses are proposed:

H1:Incongruent IT-mediated information interruption in the workplace is positively related to interruption overload.
H2:Congruent IT-mediated information interruption in the workplace is positively related to interruption overload.

Work overload appeared to be a recurring theme in the literature and have been found to be an important contributor to individuals' work exhaustion (Moore, 2000). As such, we intent to investigate the impact of interruption overload on emotional exhaustion in this study to verify the impact of IT-mediated information interruption in the workplace. There is ample evidence supporting that interruption overload has a negative impact on individuals' psychological or work outcomes, including individual performance, work performance, decision performance, emotional fatigue and so on (Hockey, 1997; Speier, Valacich, & Vessey, 1999; Adler & Benbunan-Fich, 2012; Baethge & Rigotti, 2013; Baethge et al., 2015). When being overloaded with IT-mediated information interruptions, the new-coming demands and activities have exhausted their slack valuable resources in the work time, such as time and energy (Chen & Karahanna, 2018). Drawing upon COR theory, the loss of valuable resources will increase the threat of psychological strains to individuals.

In this study, we define emotional exhaustion as the depletion of mental and emotional energy in the workplace caused by the repeated IT-mediated information interruptions (Moore, 2000; Bal & Boehm, 2019). According to Maslach and Jackson (1981), a typical psychological syndrome of emotional exhaustion in the workplace is job burnout, which involves the feelings of being emotionally overextended and exhausted. For example, when being interrupted, individuals will experience the time-based and energy-based conflicts between the primary activity and new-coming activity and feel tense, stressed, exhausted and fatigued by the need to satisfy all the demands. As is mentioned by one of our participants in Study 1:

"There may be a lot of pressure, because some of the work needs to be done on time, and then you may have more work to do." (a17)

"It (interruption) has been interrupting my progress, and I may have to work late to get my work finished, which can lead to an overload." (a18)

Therefore, the following hypothesis is proposed:

H3:Interruption overload in the workplace is positively related to emotional exhaustion.

3.2.2. Moderating effects of different processing mechanisms

Information processing mechanisms have been found to have an impact on the interruption effects on tasks (Kalgotra, Sharda, McHaney, 2019) or through cognitive load (Basoglu et al., 2009), mindfulness (Addas & Pinsonneault, 2018), subjective appraisal (Kirmeyer, 1988), process satisfaction (Hiltz, Johnson, & Turoff, 1986; Reinig, 2003; Lowry, Romano, Jenkins, & Guthrie, 2009) and so on. As is aforementioned, we targeted two different interruption processing mechanisms in this study: preemptive processing and sequential processing. According to COR theory, individuals' emotional and mental energy will be depleted no matter what processing mechanisms they choose. However, the specific processing mechanism can weaken or strengthen the relationship between interruption and individuals' interruption overload.

Preemptive processing represents the state in which an individual switches from primary work to the new-coming interruptions with the primary activity unfinished (Kirmeyer, 1988). In the technology-mediated workplace environment, individuals always get interrupted by online information, especially entertainment information interruption, such as pop-up instant messages, e-mails and notifications of other applications. These interruptions may relate to some extra-role activities (e.g., helping other colleagues with their issue) or activities that are unrelated to the primary work (e.g., chatting with family or friends), which can all be regarded as incongruent information interruption in our research context. Although these activities may not be relevant to the primary task, individuals tend to process the new-coming information interruptions before reengaging in the primary interrupted task. The reason can be contributed the finding of Barley et al. (2011) that these interruptions could act as a reminder of unfinished activities or demands. When individuals choose the preemptive processing mechanism, the reminder of unfinished activities will be addressed

first, as thus, release their interruption overload. As one of our participants put it:

"When a colleague asks me for help, I usually respond that as soon as I receive the asking even if it is not relevant to work (primary work) (a23)."

Therefore, we propose the hypothesis that:

H4a: Preemptive processing will moderate the relationship between incongruent information interruption and interruption overload, such that the positive influence will be weaker when individuals choose the preemptive processing.

Sequential processing represents the state in which individuals leave the information interruptions aside before the current activity is completed, especially when the new-coming demands can't be finished in one shot (Addas, & Pinsonneault, 2018). As is aforementioned, congruent information interruptions refer to the activities that are either relevant or complementary to the previous tasks. When being interrupted by congruent interruptions, the new-coming information may contain key information and new requirements that can be helpful with the accomplishment of the primary tasks. These congruent interruptions may sometimes motivate individuals' behavioral adjustments (Jett & George, 2003) and lead to higher performance efficiency (Czerwinski et al., 2000). Previous studies also indicate that exposure to congruent interruptions will result in a switch to mindfulness processing of the primary tasks (Baum, Frese, & Baron, 2014). Therefore, while the congruent interruptions act as complementation of the primary tasks and can improve their efficiency, individuals prefer to go on with the primary task and make progress on it rather than switch to the new demands. As one of the participants of Study 1 mentioned:

"For example, when dealing with the compliance of a set of financial contracts, the branch company just sent a relevant message, which was exactly matched with the handling of the contracts I was going to do, then it will actually promote it (the primary task). So I will try to finish the primary task better before doing the new one. (a24)"

As a consequence, we hypothesize that:

H4b: Sequential processing will moderate the relationship between congruent information interruption and interruption overload, such that the positive influence will be weaker when individuals choose the sequential processing.

3.3. Study 2:Quantitative study

In Study 2, we conducted a survey method to test the effects of two types of IT-mediated information interruption (congruent and incongruent) and the moderating role of different processing mechanisms on individuals' psychological outcomes (interruption overload and emotional exhaustion).

3.3.1. Sample

The sample targets individuals with work or internship experience. The survey invitation was sent to the individuals via online channels. After removing the rushed or incomplete response, we received 345 usable responses. Table 2 presents the demographic information of the samples. The sample consists of 33.6% males and 66.4% females. More than 76% respondents are below 35 years old, which is appropriate for this context because young employees nowadays are faced with many interruptions in the technology-mediated work context. More than 40% of the participants have 1-5 years' working experience and over 38% of the participants have been working for more than 6 years, thus, were expected to be familiar with the workplace and knowledgeable about the research context in this study. These statistical figures show that the participants are a good representation of the target population in this study.

Table 2
Demographics of participants (N = 345).

Constructs and measurement items	Category	Frequency (N = 345)	%
Gender	Males	116	33.6
	Females	229	66.4
Age	< 25	160	46.4
	26-35	104	30.1
	36-45	34	9.8
	> 45	47	13.6
Education	Senior high school	18	5.2
	Junior college	18	5.2
	University degree	239	69.3
	Graduate degree	70	20.3
Tenure	< 1 year	71	20.6
	1 -5 years	140	40.5
	6 -10 years	50	14.5
	> 12 years	84	24.3

3.3.2. Measures

We drew upon existing measurements and scales to develop our survey questions. Study 1 yielded 6 reflective constructs in the research model, including incongruent/congruent IT-mediated information interruption (III/CII), interruption overload (IO), processing mechanisms (PM) and emotional exhaustion (EE). We used the multi-item reflective measures based on a seven-point Likert scale. The reflective indicators are impacted by the latent construct, are interchangeable with each other and share a common theme (Jarvis, MacKenzie & Podsakoff, 2003).

We adopted the measurement items developed by Chen and Karahanna (2018) to assess the perceived congruent/incongruent IT-mediated information interruptions and interruption overload in the workplace. According to Addas and Pinsonneault (2018, p.383), interruption is defined as "Externally triggered temporary suspensions of an individual's primary task activities" to address the content of the new coming activities (interruptions). We measured the construct of interruption overload adopting the items used by Galluch et al., (2015) and it is closely related to the measure of perceptual overload by Chen and Karahanna (2018). Emotional exhaustion was measured using the scale developed by Singh et al. (1994). Processing mechanisms are made up of 3 compositional variables (preemptive, sequential and simultaneous), which have a constant sum. We focus on the preemptive and sequential processing in this research and dropped the variable-simultaneous to avoid the collinearity caused by the variables being compositional. Following Addas and Pinsonneault, we also transformed the variables with centered logratio to address the collinearity. We modified all the scale items to fit the context in this study. We also included the tenure of respondents as marker variable and several control variables including gender, age, education and job autonomy in our research model. Appendix 1 provides the measurement items and the final version of questionnaire.

3.3.3. Data analysis

We employed the partial least squares structural equation modeling (PLS-SEM) to analyze the data. The use of PLS-SEM has been proved to be suitable for studies with complex structural models and smaller sample sizes (Gefen, Rigdon & Straub, 2011; Shiau, Sarstedt & Hair, 2019). The advantages of PSL-SEM also include that it relaxes the normal distributional assumptions required in the data (Khan, Sarstedt, Shiau, Hair, Ringle & Fritze, 2019). Due to above reasons, PLS-SEM is deemed to be suitable for this study. The data analysis and hypotheses testing were performed using SmartPLS. We conducted the bootstrapping (5000 iterations) to access the significance levels.

3.3.3.1. Measurement model results. We first performed various tests on the construct reliability and validity to examine the measurement model estimation. Following the instruction of Sarstedt et al. (2014), the indicator loadings, constructs' internal consistency reliability, convergent validity and discriminant validity of the reflective constructs should be examined.

The internal consistency reliability indicates the consistency of the multiple indicators used to measure the same construct. In this study, we employed the Cronbach's alpha (α) to evaluate the internal consistency reliability. As is shown in Table 3, the Cronbach's alpha (α) of all the constructs exceed the recommended level of 0.7 (Nunnally, 1978), which suggests high internal consistency reliability. The convergent validity indicates the degree that the measured construct converges in its indicators (Sarstedt et al., 2014), which is assessed by average variance extracted (AVE) in this research. The acceptable value of AVE should be higher than 0.5 (Anderson & Gerbing, 1988). Therefore, the convergent validity of the constructs in this study is satisfactory.

Discriminant validity refers to the degree that the measured construct is distinct from the other constructs (Sarstedt et al., 2014; Hair, Hult, Ringle & Sarstedt, 2016). To test the discriminant validity, we adopted the following three methods: First, the square root

Table 3
Psychometric properties of measures.

Constructs	Items	VIF (<10)	Factor loadings (>0.7)	Cronbach's α (>0.7)	Average variance extracted (AVE) (>0.5)
Incongruent IT-mediated information interruption (III)	III1	2.167	0.843***	0.902	0.774
	III2	2.525	0.874***		
	III3	3.410	0.913***		
	III4	2.910	0.886***		
Congruent IT-mediated information interruption (CII)	CII1	3.796	0.938***	0.929	0.875
	CII2	3.982	0.937***		
	CII3	3.402	0.930***		
Interruption overload (IO)	IO1	2.661	0.870***	0.884	0.742
	IO2	3.470	0.914***		
	IO3	2.421	0.861***		
	IO4	1.942	0.796***		
Emotional exhaustion (EE)	EE1	2.487	0.867***	0.930	0.826
	EE2	4.108	0.929***		
	EE3	4.147	0.922***		
	EE4	3.764	0.917***		

Note: VIF—Variance Inflation Factor.
*p < 0.05, **p < 0.01, ***p < 0.001.

Table 4
Fit indices of the measurement model.

Model fit measures	Suggestive Value	Actual Value	Conclusion
SRMR	≤ 0.05	0.044	Supported
NFI	≥ 0.85	0.887	Supported

of the AVE of a construct should be larger than its inter-construct correlation with other constructs in the model (Henseler, 2017; Fornell, & Larcker, 1981). Second, the heterotrait-monotrait ratio of correlations (HTMT) value should not exceed 0.9 (Henseler, 2017). Third, the indicator loading on each construct should be higher than that on other constructs (Benitez-Amado, Henseler, & Castillo, 2017). As is shown in Table 5, Table 6 and Table 7, these results indicate high discriminant validity.

The overall fit of the research model was evaluated with several indices, including the standardized root mean squared residual (SRMR) and normed fit index (NFI). Previous studies have indicated that these indices can qualify the degree of difference between the empirical and model-implied correlation matrix (Henseler, 2017). Table 4 presents the fit indices of the measurement model. The results in Table 4 indicate an acceptable model fitting. Consequently, the fit of the measurement model is verified to be satisfactory.

3.3.3.2. Common method bias. Common method bias (CMB) is one of the main sources of measurement error, which is a potential problem in the behavior research (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003). We conducted two methods to control the method bias in this research. First, at the survey editing stage, we tried to protect the anonymity of the respondents and encouraged them to answer the survey questions honestly. In this way, the respondents' evaluation apprehension will be reduced and they will be less likely to answer the questions in a more socially desirable way. Second, we improved the scale items to reduce the method bias. Specifically, we provided a definition of the unfamiliar and ambiguous terms before the formal questions. Additionally, we tried to keep the survey questions simple, concise and clear (Podsakoff et al., 2003). Third, we adopted the marker variable approach based on the introduction of Rönkkö and Ylitalo (2011). We used the tenure of respondent as the marker variable in this study, which is consistent with previous research (Krishnan, Martin, & Noorderhaven, 2006). This marker variable is not theoretically or statistically related to other variables in the research model. After comparing between the original model and the marker variable model, we found that the significance of the paths in original model has not changed, thus indicating that common method bias is not a serious problem in this study (Lindell & Whitney, 2001). The results of the common method bias are depicted in Table 8.

3.3.3.3. Structural model results. The hypotheses testing was conducted by using the SmartPLS. Following the instructions to test the measurement model, we examined the multicollinearity, the coefficients of the determinations (R^2), path coefficients, total effects and Cohen's f^2 (Sarstedt et al., 2014). The results of the structural model results are presented in Table 9 and Figure 2.

Firstly, we examined the variance inflation factor (VIF) to test the multicollinearity (Benitez-Amado et al., 2017). The VIF values in Table 3 range from 1.942 to 4.147, supporting that multicollinearity is not a concern in this research. As is shown in Figure 2, we also reviewed the R^2 value of each construct. The predictors explained 58% and 27.4% of the variance in interruption overload and emotional exhaustion, respectively.

To answer the second research question (RQ2) (*How do IT-mediated information interruptions affect individual's emotional exhaustion?*), we tested the hypothesized relationship between congruent/incongruent IT-mediated information interruption and emotional exhaustion through individuals' interruption overload. The results indicate that incongruent IT-mediated information interruption is positively related to interruption overload ($\beta = 0.428$, $p < 0.001$). Additionally, congruent IT-mediated information interruption is also positively related to interruption overload ($\beta = 0.442$, $p < 0.001$). Further, interruption overload is positively related to individuals' emotional exhaustion ($\beta = 0.483$, $p < 0.001$). Therefore, H1, H2 and H3 are supported.

To answer the third research question (RQ3) (*How do individual's different processing mechanisms moderate the relationship between information interruption and interruption overload?*), we tested the moderating effects of different processing mechanisms on the relationship between information interruption and overload. The results indicate that preemptive processing negatively moderates the relationship between incongruent information interruption and interruption overload ($\beta = -0.079$, $p < 0.05$), supporting the H4a. Additionally, sequential processing negatively moderates the relationship between congruent information interruption and interruption overload ($\beta = -0.123$, $p < 0.01$), supporting the H4b.

We proposed that the interruption overload mediated the relationship between information interruption and emotional exhaustion. Therefore, we also conducted the mediation analysis following the instructions in existing studies (Shrout & Bolger, 2002;

Table 5
Mean, SD, and discriminant validity evaluation based on Fornell-Larcker criterion.

Construct	M	SD	III	CII	IO	EE
III	4.521	1.592	0.880			
CII	4.613	1.533	0.551	0.935		
IO	4.251	1.593	0.663	0.640	0.861	
EE	4.773	1.517	0.382	0.329	0.492	0.909

Note: Diagonal elements (bold) are the square root of AVE for each construct. Off-diagonal elements are the correlations between constructs.

Table 6
Discriminant validity based on the heterotrait–monotrait ratio of correlations (HTMT).

Construct	III	CII	IO	EE
III				
CII	0.600			
IO	0.739	0.694		
EE	0.417	0.353	0.541	

Note: All the values are the correlations of indicators.

Table 7
Discriminant validity based on cross-loading evaluation.

Indicator	III	CII	IO	EE
III1	0.843	0.466	0.552	0.356
III2	0.874	0.400	0.567	0.316
III3	0.913	0.525	0.621	0.359
III4	0.886	0.542	0.589	0.312
CII1	0.552	0.938	0.616	0.329
CII2	0.520	0.937	0.568	0.267
CII3	0.472	0.930	0.611	0.325
IO1	0.614	0.696	0.870	0.442
IO2	0.594	0.595	0.914	0.430
IO3	0.550	0.472	0.861	0.407
IO4	0.516	0.404	0.796	0.413
EE1	0.361	0.293	0.426	0.867
EE2	0.311	0.282	0.446	0.929
EE3	0.348	0.312	0.422	0.922
EE4	0.367	0.310	0.490	0.917

Table 8
Common method bias assessment.

Paths	Research model (without marker variable)	Research model (with marker variable)
Incongruent IT-mediated information interruption→ Interruption overload	0.428***	0.410***
Congruent IT-mediated information interruption→ Interruption overload	0.442***	0.424***
Interruption overload→ Emotional exhaustion	0.483***	0.483***
Preemptive processing × incongruent IT-mediated information→ Emotional exhaustion	-0.079*	-0.074*
Sequential processing × congruent IT-mediated information →Emotional exhaustion	-0.123**	-0.116**
Marker variable→ Incongruent IT-mediated information interruption		-0.001
Marker variable→ Congruent IT-mediated information interruption		-0.015
Marker variable→Preemptive processing		-0.112
Marker variable→Sequential processing		-0.110
Marker variable→ Interruption overload		-0.001
Marker variable→ Emotional exhaustion		-0.054

Note: *p < 0.05, **p < 0.01, ***p < 0.001.

Table 9
Structural model results.

Hypotheses	Paths	Beta	Total effect	Cohen's f^2
H1	Incongruent IT-mediated information interruption→ Interruption overload	0.428***	0.428	0.258
H2	Congruent IT-mediated information interruption→ Interruption overload	0.442***	0.442	0.298
H3	Interruption overload→ Emotional exhaustion	0.483***	0.483	0.315
H4a	Preemptive processing × incongruent IT-mediated information→ Emotional exhaustion	-0.079*	-0.079	0.017
H4b	Sequential processing × congruent IT-mediated information →Emotional exhaustion	-0.123**	-0.123	0.033

Note: *p < 0.05, **p < 0.01, ***p < 0.001.

Vance, Lowry, & Eggett, 2015). The results of the mediation testing are depicted in Table 10. Specifically, we bootstrapped the research model and obtained 50000 resamples. The advantages of bootstrapping include that: (1) it doesn't assume the normal distribution of the mediation effect, (2) it can be applied even when the sample size is small or moderate. (Shrout & Bolger, 2002). Specifically, the relationship between the independent variable and mediating variable is path a, the relationship between the mediating variable and dependent variable is path b, the relationship between the independent and dependent variable is path c

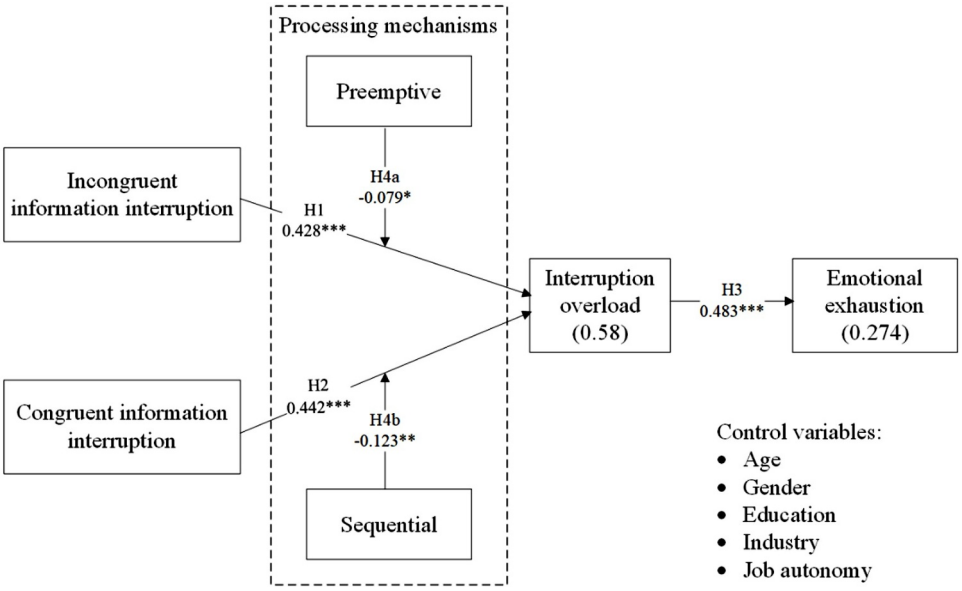

Fig. 2. Structural model with results (*p < 0.05, **p < 0.01, ***p < 0.001).

Table 10
Mediation testing results.

Independent variable	Mediation test (ab)			Full/Partial mediation test (c')			Type of mediation
	2.5% lower bound	97.5% upper bound	Zero included?	2.5% lower bound	97.5% upper bound	Zero included?	
Incongruent IT-mediated information interruption	0.118	0.264	No	-0.064	0.212	Yes	Full
Congruent IT-mediated information interruption	0.115	0.282	No	-0.136	0.160	Yes	Full

Note: *p < 0.05, **p < 0.01, ***p < 0.001.

(or path c' when including both path a and path b). It is possible to determine the results of the mediation test by examining the values of ab and c'. If zero is not included between the lower and upper bound, then we can come to a conclusion that the value of the path is not zero. If the value of path ab is zero and the value of path c' is zero, it will indicate full mediation (Vance et al., 2015). As is shown in Table 10, the effects between both incongruent/congruent information interruption and emotional exhaustion are both fully mediated by interruption overload.

4. Summary of findings

Drawing on COR theory, a model linking two types of IT-mediated information interruption to individuals' psychological outcome through interruption overload was developed. A deeper understanding of the effect of IT-mediated information interruption is provided and this study argues that our understanding of the effects can be enhanced if we take the different coping process of information interruptions into consideration.

For the first research question (RQ1), this study provided several important findings. Firstly, congruent IT-mediated information interruption and incongruent IT-mediated information interruption can both impact individuals' psychological performance. Specifically, information interruption can increase individuals' interruption overload, which subsequently leads to their emotional exhaustion in the workplace. When being interrupted, individuals usually prefer to choose two processing mechanism, including the sequential processing mechanism and preemptive processing mechanism.

To answer the second research question (RQ2), we came to the following conclusions. Congruent IT-mediated information interruption and incongruent IT-mediated information interruption are both positively related to individuals' interruption overload and there is no significant difference between the two effects. This result indicates that the two types of IT-mediated information interruption affect individuals' interruption overload at the same degree. Our explanation for this result is that, with the widespread of IT usage and frequent online team collaboration in the workplace, both incongruent and congruent information interruption are ubiquitous during work time. Additionally, both types of IT-mediated information interruption entail the resources shifting from the primary work tasks to the new-coming interruptions. The loss of time and energy caused by the resources shifting leads to their psychological strains including interruption overload and emotional exhaustion.

For the third research question (RQ3), we came up with the following conclusions. Processing mechanism can moderate the relationship between information interruption and interruption overload. Specifically, when being exposed to incongruent IT-mediated online information interruptions, preemptive processing can weaken individuals' interruption overload caused by the interruptions. The explanation for this result can be that incongruent can be regarded as a reminder of an unfinished task which will increase individuals' interruption overload (Barley et al., 2011). Therefore, addressing the new-coming activity first will decrease their overload. On the other hand, when being exposed to congruent information interruptions, sequential processing can weaken individuals' interruption overload caused by the interruptions. One explanation for this can be that congruent interruptions sometimes provide important information and act as complementation role for the primary task, which may even increase work efficiency (Raabe, Frese, & Beehr, 2007). Therefore, the priority should still be their primary task. As such, sequential processing will increase the whole efficiency of their task procedure and decrease the interruption overload.

5. Implications

5.1. Theoretical contribution

This study makes three contributions to the literature. First, it contributes to COR theory by extending the literature to the IT-mediated information interruptions context in the workplace, which have not been well investigated in COR theory. Previous studies on COR theory argued that resource allocation is a mindful process motivated by individuals' need to acquire resources (Penney et al., 2011; Halbesleben & Wheeler, 2015). Drawing upon COR theory in the work interruption context in this study, we can also develop a better understanding of individuals' resource allocation between the primary task and interruptions in a dynamic perspective. Our investigation also shed light on the impacts of different processing mechanisms, which can also be regarded as the reallocation of time and energy during work time.

Second, our paper advances the current understanding of the "dark side" of online information behavior by investigating the multiple effects of IT-mediated information interruption, involving the interruption overload and processing mechanisms. Previous studies tended to test the negative impact of interruptions in the workplace, however, the multiple impacts derived from different processing mechanisms are largely ignored (Adamczyk & Bailey, 2004; Bailey & Konstan, 2006; Monk, Trafton, & Boehm-Davis, 2008; Dodhia & Dismukes, 2009; Clapp, Rubens, Sabharwal & Gazzaley, 2011). Our findings provide empirical evidence on the moderating effects of different processing mechanisms, including preemptive and sequential processing. Identification of such effects articulates the complex conditions that individuals face in the technology-mediated workplace. Although IT-mediated information interruptions can lead to an increasing in individuals' interruption overload, they can choose specific processing mechanisms to decrease the overload brought by the interruptions. Additionally, the findings in this research open new avenues for future research, such as examining how other technological tools or media capabilities could impact individuals' evaluation of the online interruptions.

Third, we contributed to the literature by focusing on individuals' psychological performance instead of merely on their work performance, which has been widely investigate in previous studies (Bailey & Konstan, 2006; Cheng, Gu, & Shen, 2019; Cheng, Fu, & Druckenmiller, 2016; Clapp, Rubens, Sabharwal, & Gazzaley, 2011; Dodhia & Dismukes, 2009; Monk, Trafton, & Boehm-Davis, 2008). As is aforementioned, emotional exhaustion can be considered as a form of psychological cost entailed by the frequent IT-mediated information interruptions (Kong et al., 2018). Therefore, emotional exhaustion is an important issue that needs to be addressed in the future research. This paper bridges the gap in work interruptions literature that only investigate the behavior outcomes without examining the psychological outcomes.

5.2. Practical implication

Findings of this study also have important implications for practice. First, this study contributes to the limited understanding the effects of IT-mediated information interruptions in the workplace. IT-mediated information interruption is a common and unavoidable phenomenon nowadays, especially in the technology-mediated work environment, which will largely hinder individuals' performance. As a consequence, it is of vital importance to develop effective interruption management programs for both the managers and the employees themselves. Our findings help to understand the mechanisms through which the different processing mechanisms of IT-mediated information interruptions impact individuals' psychological performance.

Managers are now paying more attention to individuals' psychological performance rather than merely to their work performance in the workplace. The reason is that a good level of psychological state can serve as a valuable resource and help increase work performance (Penney, Hunter, & Perry, 2011). In contrast, emotional exhaustion may result in the loss of resources and influence work performance as well as physical health. Our research model provides the evidence on how the IT-mediated information interruptions can affect their psychological outcome (interruption overload and emotional exhaustion), no matter the interruptions are congruent or incongruent with their primary work. Although the congruent information interruptions can sometimes have a positive impact on individuals' work performance (Addas & Pinsonneault, 2018), the increase in the work performance may come at the price of increased interruption overload and emotional exhaustion. Therefore, managers can develop specific information interruptions processing polices to minimize individuals' time and energy loss during their work time. For the congruent information interruption, they can specify a time window for the individuals to deal with the new-coming demands that are relevant to their primary task based on their relevance or urgency.

Third, our findings can also encourage individuals to choose the appropriate processing mechanism when being interrupted by

online information in the workplace. For example, when being interrupted by congruent information, individuals should try to avoid shifting to the new-coming demands immediately with the primary work unfinished. On the other hand, the findings in this research suggest that preemptive processing mode will decrease the interruption overload caused by incongruent information interruption. Therefore, we suggest that when being interrupted by incongruent information interruption, they might well finish the new-coming activities first, especially when they are short.

In addition, technological developers should also design new powerful functions or tools for users to better manage interruptions. For example, the applications can differentiate the communications or contacts based on the information type and urgency and provide with the reminder function to come back later (Chen & Karahanna, 2018). Such kinds of interruption management systems are also a new direction in the human-computer action field (Vilwock, Madiraju, & Ahamed, 2013).

6. Limitations and future research

This study has the following limitations. We chose the individuals with work experience in China randomly as our sample. Since the data collection was conducted only in Chinese, certain characteristics of Chinese may limit the generalizability and external validity in this research (Peng, Wang, & Chen, 2019). Future research could address this problem by a comparison of the findings based on samples from different cultures and different countries. We controlled the demographic information, industry and some variables that could have an effect on individuals' perceived strain and outcome in the workplace. However, given that there are heterogeneities in different industries, it will be an interesting direction to take the specific industry cues into consideration in future research. Additionally, there are some other variables that may have an effect on individuals' perception and processing mechanisms when being interrupted during work, such as their personality, self-disciplines, task cues, urgency of the interruptions and so on (Chen & Karahanna, 2018), which can be considered on this topic in the future research.

Construct measurements

Constructs and measurement items	References
Incongruent IT-mediated information interruption	Chen, A., & Karahanna, E. (2018).;
During my work time, I frequently get interrupted about matters that are not relevant to my current work through technology.	Addas, S., & Pinsonneault, A. (2018).
I frequently stop what I am doing during my work time to initiate activities that are not relevant to my current work through technologies.	
I experienced many distractions that are not relevant to my current work during my work time.	
Interruptions non-related to my current work come frequently in my work time.	
Congruent IT-mediated information interruption	Chen, A., & Karahanna, E. (2018);
During my work time, I frequently get interrupted about matters that are relevant to my current work through technology.	Addas, S., & Pinsonneault, A. (2018).
I frequently stop what I am doing during my work time to initiate some other activities that are relevant to my current work through technologies.	Constucts from Study 1
I experienced many distractions that are sometimes relevant to my current work during my work time.	
Some interruptions related to my current work come frequently in my work time.	
Interruption overload	
During my work time, I have more information interruptions than I have energy to deal with.	Galluch, P. S., Grover, V., & Thatcher, J.
During my work time, information interruptions take up more energy than I have.	B. (2015).; Chen, A., & Karahanna,
During my work time, the number of information interruptions I receive exceeds my ability to handle them.	E. (2018)
During my work time, I don't have enough time to deal with all the interruptions that I receive.	
Processing mechanism (When I am processing the incoming information,…) (Respondents were asked to distribute 100 percentages to the different options)	Speier, C., Vessey, I., & Valacich, J. S. (2003); Kirmeyer, S. L. (1988).
I tend to process primary work activity before the next was begun.	
I tend to immediately stop primary work and attend fully to the interruptions.	
I tend to continue the ongoing work and simultaneously process the interruptions.	
Emotional exhaustion (After dealing with much information interruption in worktime,……)	Singh, J., Goolsby, J. R., & Rhoads, G.
I feel emotionally drained from dealing with much information interruption in my work.	K. (1994).
I feel emotionally fatigued because of the frequent information interruption during my job.	
I feel burned out from the frequent information interruption during my job.	

CRediT authorship contribution statement

Xusen Cheng: Conceptualization, Methodology, Data curation, Formal analysis, Investigation, Resources, Supervision, Project administration, Funding acquisition, Writing - review & editing. **Ying Bao:** Investigation, Writing - original draft. **Alex Zarifis:** Writing - review & editing.

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