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The mixed blessing of cyberloafing on innovation performance during the COVID-19 pandemic

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ABSTRACT

The COVID-19 pandemic has produced major changes in work routines. With many people now working from home, cyberloafing is increasingly widespread. The COVID-19 pandemic is also an economic downturn that is disruptive and challenging for organizations. Innovation is a vital strategy for organizations to survive and recover from the pandemic crisis. Recent research suggests that cyberloafing can produce complex workplace outcomes. Therefore, we seek to explore how and why cyberloafing affects employee innovation performance. Based on the conservation of resources theory, our study explores the potential positive and negative effects of cyberloafing on employee innovation performance by identifying job anxiety, state gratitude and perceived meaning of work as critical mediating mechanisms in the COVID-19 pandemic. Results from an online survey (N = 544) during the COVID-19 pandemic showed that COVID-19 based informational cyberloafing was positively related to employees' innovation performance by enhancing their perceived meaning of work. It simultaneously weakened and strengthened employees' perceived meaning of work through increased job anxiety and state gratitude, and ultimately had mixed effects on innovation performance. Our findings provide both theoretical and practical insights on personal internet use as well as innovation activation in crises.

1. Introduction

The outbreak of the COVID-19 pandemic led to an unprecedented massive and rapid shift in people's work routines. Organizations and employees have been forced to transform from working in the office to working at home due to workplace lockdowns and social distancing requirements. With more exposure to the internet and smart devices but less managerial monitoring when working from home, it is easier for employees to engage in cyberloafing, the personal internet-based activities at work (Lim, 2002; O'Neill et al., 2014). More non-work-related internet use in work time might impact employees' work (e.g., Andreassen et al., 2014; O'Neill et al., 2014; Syrek et al., 2018), and the consequences have received increasing attention (e.g., Derks et al., 2021; Holland & Bardoel, 2016; Sonnentag et al., 2018; Wu, Mei, Liu, & Ugrin, 2020a; 2020b). Grounded in the conservation of resources (COR) theory, this study explores how and why cyberloafing might affect innovation performance in the COVID-19 context (Halbesleben et al., 2014; Hobfoll et al., 2018). We hypothesize that cyberloafing has both negative and positive effects on employees' innovation performance,

mediated by loss and gain in emotional resources (job anxiety and state gratitude) and cognitive resources (perceived meaning of work).

Innovation is a key strategic response to crises such as the COVID-19 pandemic (Wenzel et al., 2020). The COVID-19 pandemic is not only a health emergency but an economic downturn, which creates an extreme environment of volatility, uncertainty, complexity and ambiguity for organizations (Biron et al., 2020). Innovation is a vital mechanism for organizational survival and recovery, and for maintaining competitiveness when confronted with threats and challenges during and after the pandemic (Chesbrough, 2020; Lee & Trimi, 2020; Wang et al., 2020). However, there is a lack of research on how to activate individual innovation during the COVID-19 crisis. Derin and Gökçe (2016) provided initial evidence that cyberloafing may be one way to initiate employee innovation. However, cyberloafing has been increasingly verified to have both a dark side and a bright side (e.g., Lim & Chen, 2012; Wu et al., 2020a, 2020b). Even though there are more studies examining the positive outcomes of cyberloafing at work (e.g., Andel et al., 2018; Derin & Gökçe, 2016; Sonnentag et al., 2018), it is essential to recognize the negative effects of cyberloafing because it is also a

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workplace behavior that brings organization loss (e.g., Askew et al., 2014; Lim, 2002). Therefore, it is limiting to consider the cyberloafing–innovation relationship from only a single perspective and it is important to analyze the double-sided effects of cyberloafing on employees’ work. This study probes how and why cyberloafing affects employees’ innovation performance from both the positive and negative perspectives.

Specifically, the study concentrates on the typical type of cyberloafing during the COVID-19 pandemic — browsing online news about the pandemic during working hours, which we define as COVID-19 based informational cyberloafing. During the fast-moving COVID-19 crisis, employees would frequently read or watch related news on websites or smart devices (Yan et al., 2021). We explore how this common activity might influence employees’ emotions, attitudes and behavioral outcomes. We deconstruct the emotion-and-cognition-mediated mechanism that might explain the mixed effects of COVID-19 based informational cyberloafing on innovation performance based on the COR theory as a theoretical framework. The COR theory fits in with our propositions on diverse pathways between COVID-19 based informational cyberloafing and innovation performance because it emphasizes that individual behaviors are correlated with resource gain or drain (Halbesleben et al., 2014; Hobfoll, 1989; Hobfoll et al., 2018). Cyberloafing is a mixed blessing because it leads not only to resource depletion but also resource recovery (Kim & Christensen, 2017; Wu et al., 2020a). To analyze the mechanisms underlying how COVID-19 based informational cyberloafing influences innovation performance, we identified two important resources (emotional and cognitive resources) from the individual resource pool and focused on two specific emotional constructs (job anxiety and state gratitude) and one cognitive construct (perceived meaning of work). We focus on these two psychological resources for the following reasons. Firstly, emotions and cognitions have been identified as valuable personal resources that allow people to fulfill job requirements and goals (Lee et al., 2020; Liu et al., 2008). Secondly, mental health is a key issue in the COVID-19 pandemic that has attracted considerable research attention (e.g., Trougakos et al., 2020; Zhang, Wang, et al., 2020). Therefore, it is significant to identify psychological mechanisms underlying the relationship between COVID-19 based informational cyberloafing and innovation performance.

Grounded in the COR theory, we posit that COVID-19 based informational cyberloafing would increase an employee’s job anxiety, state gratitude and perceived meaning of work. Job anxiety is a negative emotion related to experiences at work (Muschalla et al., 2010) which represents emotional resource loss and state gratitude is the common positive emotional reaction to others’ kindness and dedication (Fehr et al., 2017), which represents emotional resource gain. Employees’ perceived meaning of work refers to how they evaluate the value and significance of their work that is an important motivational resource (Lips-Wiersma, 2012; Steger et al., 2012). Employees with sufficient resources would strive to develop resource surpluses in order to avoid potential future loss (Hobfoll, 1989), which indicates there would be resource spirals among different resources (Hobfoll, 2001, 2011).

Accordingly, we posit that COVID-19 based informational cyberloafing inspires employees to innovate by enhancing their self-recognition of work meaningfulness. We also hypothesize there are serial mediations between emotions and cognitions because emotions influence cognitions (Fredrickson, 1998, 2001). COVID-19 based informational cyberloafing might hinder innovation through the serial mediation effect of increasing job anxiety and decreasing meaningfulness of work. On the other hand, COVID-19 based informational cyberloafing might facilitate innovation by increasing employees’ state gratitude and perception of work meaningfulness. Thus, we construct a fine-grained explanatory framework for the contrasting pathways from cyberloafing to innovation performance, which is presented in Fig. 1.

Overall, the research investigates the mixed effects of cyberloafing on innovation performance in the context of the COVID-19 pandemic and contributes to the literature in three ways. First, by introducing the distinct processes of changes to emotional and cognitive resources, this study uncovers how cyberloafing affects innovation performance. The paradoxical effects of COVID-19 based informational cyberloafing on innovation performance revealed in our study extends our understanding of the cyberloafing-innovation relationship. Second, this study advances our knowledge of the antecedents of work meaningfulness by providing insights into how workplace behavior shapes employees’ work attitude from a resource perspective. Finally, this study enriches the COVID-19 literature through an investigation centered on employees’ emotional, attitudinal and behavioral reactions during the pandemic, which provides new ideas for research and practice on organizational management and readjustment in widespread crises.

2. Theoretical background and hypotheses

2.1. COVID-19 based informational cyberloafing

Cyberloafing has been widely characterized as any spontaneous act of employees surfing non-work-related websites and checking personal emails during work time (Lim, 2002). There are various types of cyberloafing such as sending and receiving non-work-related emails, online chatting, online shopping and visiting non-work-related websites. Specifically, surfing mainstream websites including news and shopping websites was considered as the typical minor cyberloafing which employees are more likely to engage in (Blanchard & Henle, 2008). Particularly in the context of the rapidly changing COVID-19 pandemic, people have an urgent need to know the most up-to-date details affecting their health and work. Therefore, surfing websites to get information would be a frequent form of cyberloafing. Based on Van Doorn (2011), cyberloafing activities are categorized into four streams: social (e.g., online communication), informational (e.g., retrieving information), leisure (e.g., entertaining), and virtual-emotional (e.g., shopping online, any activity that meets individual wants except the three above). Using these descriptions, we identify employees’ cyberloafing behaviors of browsing COVID-19 related news and information through the internet during work time as COVID-19 based informational cyberloafing.

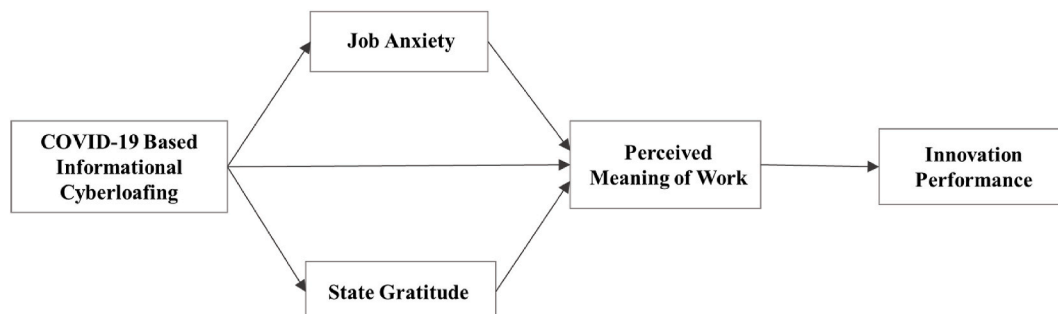


Fig. 1. Conceptual model.

Cyberloafing is complex: it has both a dark side and a bright side. On the one hand, cyberloafing is commonly regarded as a workplace deviance that causes productivity loss or extra liabilities (e.g., [Askew et al., 2014](#); [Lieberman et al., 2011](#); [Lim, 2002](#); [Sipior & Ward, 2002](#)), which depletes employees' finite resources. On the other hand, cyberloafing can yield unexpected benefits because it helps employees recover or supplement resources through temporary detachment from work. For instance, by offering micro-breaks, cyberloafing allows employees to cope with work stress (e.g., job burnout, [Aghaz & Sheikh, 2016](#); workplace ostracism, [Koay, 2018](#); workplace boredom, [Pindek et al., 2018](#); work aggression, [Andel et al., 2019](#)), enhance work engagement ([Syrek et al., 2018](#)), and improve mental health ([Wu et al., 2020a](#)). [Van Doorn \(2011\)](#) described cyberloafing as a multi-dimensional construct consisting of four attributes: development, recovery, deviance, and addiction. Drawing from the extant findings, we posit that COVID-19 based informational cyberloafing can result in not only resource consumption but also resource accumulation.

2.2. Effects of COVID-19 based informational cyberloafing on resources gain and drain

According to the COR theory, because people always strive to remain, protect and build valued resources, actual or potential resource loss would cause stress ([Hobfoll, 1989](#); [Hobfoll & Lilly, 1993](#)). People's resource investment primarily aims to avoid resource loss and secondarily to seek resource gain ([Halbesleben et al., 2014](#); [Hobfoll, 2001, 2011](#)). The COR theory provides an important interpretation for organizational psychology and behavior ([Hobfoll, 2002](#); [Hobfoll et al., 2003, 2018](#)). [Halbesleben et al. \(2014\)](#) clarified a resource as anything that helps individuals to attain goals. Specifically, emotions and cognitions have been classified as personal psychological resources as they help people fulfill job needs ([Lee et al., 2020](#); [Liu et al., 2008](#)).

2.2.1. COVID-19 based informational cyberloafing and job anxiety

Anxiety is a widespread feeling during the COVID-19 pandemic ([Hu et al., 2020](#); [Trougakos et al., 2020](#)). Job anxiety is a specific type of anxiety that relates to what is occurring at work and what people are thinking about work ([Muschalla et al., 2010](#)). It is commonly characterized by subjective feelings of tension, nervousness and worry, which are transitory and stimuli-responsive to the current work situation ([Hodges & Spielberger, 1969](#); [Zalewska, 2011](#)). In our study, job anxiety refers particularly to state or situational emotion reactions responding to the specific working conditions during the COVID-19 pandemic.

State anxiety is the typical manifestation of the psychological distress caused by resource loss ([Hobfoll & Lilly, 1993](#)). Browsing COVID-19 related news and messages on the internet during work hours is an at-work digital distraction ([Chen et al., 2020](#)), which diverts employees' limited resources available for work, such as time and energy, to the non-work domain. It implies that COVID-19 based informational cyberloafing is the resource depletion at work that might increase stress and manifest as higher job anxiety. The COVID-19 crisis also poses widespread threats to individual life and livelihood ([Hu et al., 2020](#)), such as health-related anxiety, job insecurity and financial insecurity ([McFarland et al., 2020](#); [Probst et al., 2020](#); [Trougakos et al., 2020](#)). Reading or watching COVID-19 related news and messages might expose employees to the fear of life fragility, economic instability and employment uncertainty. The emerging threats of this traumatic event make excessive work demands on and deplete resources for employees ([Vaziri et al., 2020](#)), which engenders greater stress and thus leads to more intensive job anxiety. Inferring from the above, we posit that COVID-19 based informational cyberloafing positively relates to job anxiety.

2.2.2. COVID-19 based informational cyberloafing and state gratitude

State gratitude is conceptualized at the event level as the transient sense of appreciation in response to the experiences of receiving

kindness, help or benefits from others ([Fehr et al., 2017](#)). Gratitude can be elicited on many occasions when one feels benevolence or altruism ([McCullough et al., 2001](#)). It arises from broader sources, such as any material or spiritual dedication from others, in crises like the COVID-19 pandemic. In contrast to guilt or indebtedness, gratitude is essentially a positive and pleasant emotion that increases people's emotional resources ([McCullough et al., 2001](#)), and is often associated with various positive emotions such as happiness, vitality, optimism and hope ([McCullough et al., 2002](#)). [Spence et al. \(2014\)](#) developed the psychometric instrument to measure state gratitude at the workplace, which aggregated positive emotional terms such as grateful, warm, happy, appreciation and generosity. State gratitude is distinguished from trait gratitude because it refers to context-based, momentary psychological reactions to specific experiences and situations ([McGuire et al., 2019](#); [Wood et al., 2008](#)).

Because cyberloafing through browsing activities could produce positive affect ([Blanchard & Henle, 2008](#); [Lim & Chen, 2012](#)), we posit that COVID-19 based informational cyberloafing might arouse stronger state gratitude. Cyberloafing can be a source of recovery, which helps employees reduce their discomfort at work and restore their positive emotions ([Ivarsson & Larsson, 2011](#); [Van Doorn, 2011](#)). Empirical evidence supports that being tentatively immersed in the internet helps employees cope with stressful workplace experiences and alleviates emotional exhaustion ([Koay, 2018](#); [Koay et al., 2017](#)). In other words, cyberloafing allows employees to supplement their emotional resources (i.e. positive emotions). Particularly in the context of the COVID-19 pandemic, there are so many people devoting to fight the pandemic and protect humans' well-being (e.g., health and steady jobs). People would be easily felt themselves benefited from the help or goodwill of others ([Yan et al., 2021](#)). Thus, we hypothesize that reading or watching pandemic-related news may increase state gratitude.

2.2.3. COVID-19 based informational cyberloafing and perceived meaning of work

The perceived meaning of work refers to one's subjective experience of the significance, functions or value of the work to oneself ([Steger et al., 2012](#); [Wrzesniewski et al., 2003](#)), which is customarily thought to be a positive construct ([Rosso et al., 2010](#)). Work meaningfulness is a critical resource for people's work that helps them realize their goals, growth and development in work ([Johnson & Jiang, 2017](#)).

According to [Van Doorn's \(2011\)](#) multi-dimensional description of cyberloafing, we classify browsing COVID-19 related news and messages as informational and developmental cyberloafing activities, which is a potential source of learning. Through browsing COVID-19 related news and messages, employees can get timely up-to-date information on the pandemic and progress being made in preventing and controlling the pandemic. Learning about the pandemic can help people not only emotionally but also rationally be prepared to better arrange their work and life in such an unusual situation, such as comforting themselves and taking protective measures. With more knowledge about the COVID-19 pandemic, they might be aware that work is an essential contribution to individual, organizational and even societal recovery from the COVID-19 crisis. Believing they can fulfill the demands of self-worth and even social identity through work during the COVID-19 pandemic, employees deepen their perception of work meaningfulness which increases their cognitive resources.

Taken together, we have the following hypothesis:

Hypothesis 1. COVID-19 based informational cyberloafing is positively related to employees' (a) job anxiety, (b) state gratitude, and (c) perceived meaning of work.

2.3. Indirect paths between COVID-19 based informational cyberloafing and innovation performance

Innovation is crucial for organizations to adapt to rapid changes and

remain competitive in a dynamic environment (Gunday et al., 2011; Ovuakporie et al., 2021), especially during the COVID-19 crisis (Breier et al., 2021; Ebersberger & Kuckertz, 2021; Wang et al., 2020; Wenzel et al., 2020). Improving innovation performance is a key objective for both employees and organizations in such an environment full of challenges and threats (Kotabe et al., 2017; Zhang, O’Kane, & Chen, 2020). Therefore, how to enhance innovation performance has received wide and prolonged attention and is studied from various perspectives and at different levels. Anderson et al. (2004) summarized factors influencing innovation performance, such as personality, motivation, cognitive ability, job characteristics, and moods. Emotion states are influential for innovation performance by enabling flexible cognitions (Lin et al., 2014). Thus, innovation performance is associated with both emotional and cognitive resources, and cognitive factors tend to be its proximal predictors.

2.3.1. Mediation effect of perceived meaning of work

The perceived meaning of work is associated with intrinsic work motivations (Lips-Wiersma, 2012; Steger et al., 2012), which is a significant predictor of innovation performance (Amabile, 1985). A sense of meaningfulness derived from work is an important job resource that fosters the achievement of individual goals, growth and development at work (Johnson & Jiang, 2016). Employees with greater meaningfulness in their work would be more prompted to cognitively connect themselves with their work and consequently devote more resources to work (Ahmed, Majid, & Zin, 2016). For instance, the meaning of work was found to be correlated with better well-being at work (Ahmed et al., 2016; Steger et al., 2012), superior job satisfaction (Steger et al., 2012), more work engagement (Ahmed et al., 2016; May et al., 2004) and improved job performance (Kosfeld et al., 2017). Conforming to the tenet of COR theory, people with more resources would invest in more resource-gaining activities (Hobfoll, 2001, 2011). Employees who think their work is full of purpose and value have more cognitive resources, so they would be more inclined to engage in resource-developing activities such as innovation. Extrapolating, we put forward the second hypothesis:

Hypothesis 2. The perceived meaning of work mediates the relationship between COVID-19 based informational cyberloafing and employee innovation performance.

2.3.2. Serial mediation effect of job anxiety, state gratitude and perceived meaning of work

Stemming from the COR theory, the loss spiral and gain spiral are two corollaries stating the dynamic process of individual resources. People who suffer from resource reduction are more vulnerable to ongoing decrease which begets a loss spiral. On the contrary, a gain spiral means that people with more resources are more capable of sustaining resource accumulation (Hobfoll, 2001, 2011). People’s behavioral decision making depends on the payoff from resource investment (Hobfoll, 2001). When people lack resources, they tend not to invest in risk-taking activities such as innovation, with the possibility of either resource gain or drain, to avoid potential loss. However, people with more available resources would be relatively more inclined to undertake risky activities to pursue future gains.

From the resource perspective, increasing job anxiety resulting from COVID-19 based informational cyberloafing is actually the exhaustion of emotional resources, which traps employees in a resource loss spiral. Negative emotions might narrow employees’ cognition (Fredrickson & Joiner, 2002; Kalron et al., 2018). Employees with intensive job anxiety might have more depressed and pessimistic thoughts about their work meaningfulness, incurring excessive cognitive resource loss and thus reducing their motivation to innovate.

On the contrary, in our research context, reinforced state gratitude is the growth of emotional resources brought by COVID-19 based informational cyberloafing, which might lead to further resource

accumulation. Positive emotions can build cognitive resources and broaden the thought–action repertoires (Fredrickson, 1998, 2001). We posit that employees with stronger state gratitude can more optimistically perceive the meaning of their work. Greater work meaningfulness would make employees more motivated and equipped to invest in innovation to exploit new resources. Taken together, we proffer two hypotheses:

Hypothesis 3. Job anxiety and perceived meaning of work serially mediate the relationship between COVID-19 based informational cyberloafing and employee innovation performance.

Hypothesis 4. State gratitude and perceived meaning of work serially mediate the relationships between COVID-19 based informational cyberloafing and employee innovation performance.

3. Methods

3.1. Data gathering

Data were collected through an online survey in China during the early days of COVID-19 in early April 2020. The questionnaire was created using Wenjuanxing, a professional platform for online surveys in mainland China, and the questionnaire link was sent via WeChat to personal contracts. The participants were asked to forward or post the links among their WeChat groups. Participants were informed that the questionnaire focused on the work behaviors and psychological states during the COVID-19 pandemic, and assured that the survey would be confidential and anonymous and that the results would only be used for research, which strengthens the authenticity of the answers. Participants were asked to provide demographic information (e.g., sex, age, tenure, etc.) and self-evaluation of work-related emotions, attitudes and behaviors during the pandemic.

3.2. Sample

We approached 556 participants including MBA students with more than 5 years’ working experience from Shanghai, parents of undergraduate students from all over China, and new employees with one or two years’ working experience from the Pearl River Delta Economic Zone. The participants were employees in a wide range of industries, including manufacturing, finance, real estate, IT, healthcare, engineering, accommodation and tourism, transportation, and education, and a wide range of organizations including state-owned enterprises, private enterprises, foreign-funded enterprises, public institutions, and government agencies. We included participants from various organizations and industries to make the results generalizable to different organizational settings as far as possible. After screening out invalid surveys (i.e., surveys whose items all had the same score, and those surveys finished in an implausibly short time or with missing items for key variables), the final sample comprised 544 surveys with a valid response rate of 98%.

The sample had 235 males (43%) and 309 females (57%), whose average age was 32.81 (SD = 8.34) years old. Over half of the participants (59%) had an undergraduate education and 24% had a master’s degree. The average organizational tenure was 5.6 (SD = 6.08) years. Almost half of the participants (46%) were ordinary employees, while 24% were frontline managers or middle managers, and 8% were top managers.

3.3. Measures

Apart from COVID-19 based informational cyberloafing, other constructs were measured using mature scales that have been validated in past research. All the key constructs were measured with five-point Likert scales ranging from 1 for “strongly disagree” to 5 for “strongly agree”.

3.3.1. COVID-19 based informational cyberloafing

To assess employees' COVID-19 based informational cyberloafing, we developed a new scale grounded in the existing literature. We first generated the initial set of items based on the mature measure of cyberloafing (Lim & Teo, 2005) and realities during the COVID-19 pandemic. Eight volunteers with practical working experience were invited to judge whether the measurement items were easy to understand. Then, we made some corrections after discussion to assess the content validity and ensure the completeness and accuracy of item expression. Six items were included in the final scale. Example items were "Visit news sites to follow the progress of COVID-19 prevention and control released by the authorities (e.g., real-time data, scientific research progress, and material supply)", "Browse public opinion (e.g., ineffective government work, suffering situations of patients, etc.) through various social media platforms (e.g. WeChat, Weibo, etc.)", "Pay close attention to the recovery of social life from pandemic including the resumption of work, transportation, tourism, etc.)."

3.3.2. Job anxiety

The four-item scale originally developed by De Jonge and Schaufeli (1998) was used. An example item was "I feel anxious at work".

3.3.3. State gratitude

A five-item scale developed by Spence et al. (2014) was used. An example item was "I feel a warm sense of appreciation".

3.3.4. Perceived meaning of work

Of the 10-item scale developed by Steger et al. (2012), nine items were retained, while the reverse coded item was excluded because it might lead to respondents' inattention and confusion, and then lower accuracy, validity and reliability (Schriesheim et al., 1991; Van Sonderen et al., 2013). An example item was "I view my work as contributing to my personal growth".

3.3.5. Innovation performance

A five-item scale developed by Hou (2012) was used, which had been designed based on Scott and Bruce (1994) and Janssen (2000), as suitable for individual-level self-assessment of innovation performance. An example item was "I was able to search out new technologies, processes, techniques and/or product ideas".

3.3.6. Control variables

Gender, age, education and organizational tenure were used as the control variables because of their potential effects on the exogenous variables in this model (e.g., Hammond et al., 2011; Lim & Chen, 2012; Luksyte et al., 2018; Schnell, 2009). Gender was coded as male = 0 and female = 1. Education was coded as those below college degree = 1, college degree = 2, bachelor degree = 3, master degree = 4 and doctor

degree = 5. Employees' age and their tenure in their current organization were measured by the number of years.

4. Results

In this section, we assess the validity of key variables, present the statistical characteristics of our sample, and then test the proposed main and mediation effects between variables. The collected data were analyzed in three phases. First, the data were randomly split into two sub-samples. The first sub-sample (n = 262) was used for exploratory factor analysis (EFA) to examine the structure of COVID-19 based informational cyberloafing. Next, confirmatory factor analysis (CFA) was conducted based on the second sub-sample (n = 282) to evaluate the construct validity. Finally, the sub-samples were recombined for common method biases analysis, statistical analytics, and hypothesis testing. Structural equation modeling (SEM) was used to test the hypothesized paths. SPSS 25 was used to perform exploratory factor analysis (EFA) and statistical analysis, and Mplus 8.3 for confirmatory factor analysis (CFA) and structural equation modeling (SEM).

4.1. Validity assessments

4.1.1. Exploratory factor analysis

The six items for COVID-19 based informational cyberloafing were subjected to exploratory factor analysis (EFA) in SPSS 25 with the first sub-sample (n = 262). The Kaiser-Meyer-Olkin coefficient ($KMO_{COVID-19}$ based informational cyberloafing = 0.855) and Bartlett's Test of Sphericity ($\chi^2(15) = 492.968, p = 0.000$) indicated that item-correlations were large enough to perform factor analysis. The results of exploratory factor analysis (EFA) found one factor with eigenvalue greater than 1.0 and its cumulative variance contribution exceeded 53%. Six items of this factor loaded over 0.60, and the cross-loadings between them and the measurement items of other constructs were not serious (less than 0.3). To summarize, COVID-19 based informational cyberloafing is a single-factor construct comprised of six items and well discriminated from other constructs.

4.1.2. Confirmatory factor analysis

Based on the second sub-sample (n = 282), we conducted confirmatory factor analysis in Mplus 8.3. Table 1 outlines all of the model fit statistics. The five-factor model of COVID-19 based cyberloafing, job anxiety, state gratitude, perceived meaning of work and innovation performance fitted the data significantly better than all the alternative models ($\chi^2(367) = 982.835; RMSEA = 0.077; CFI = 0.915; TLI = 0.906; SRMR = 0.053$). The results adequately supported the discriminant validity of five key variables. In addition, significant factor loadings indicated satisfactory convergent validity.

Table 1
Results of confirmatory factor analysis.

Model	χ^2	df	RMSEA	CFI	TLI	SRMR
Five-factor model	982.835	367	.077	.915	.906	.053
Four-factor model: State gratitude and perceived meaning of work combined	1890.409	371	.121	.789	.769	.104
Four-factor model: Job anxiety and state gratitude combined	2044.229	371	.126	.768	.746	.157
Four-factor model: Job anxiety and perceived meaning of work combined	2212.852	371	.133	.745	.720	.113
Three-factor model: Job anxiety, state gratitude and perceived meaning of work combined	3122.106	374	.161	.619	.586	.144
Two-factor model: COVID-19 based informational cyberloafing, job anxiety, state gratitude and perceived meaning of work combined	3424.456	376	.170	.577	.543	.153
One-factor model	4280.989	377	.192	.459	.417	.160

Note. N = 282. RMSEA is the root-mean-square error of approximation, CFI is the comparative fit index, TLI is the Tucker-Lewis Index, and SRMR is the standardized root mean square residual.

4.1.3. Common method biases analysis

Common method biases might have contaminated the observed relationships in our study, so we took measures to control for this problem. “Generally speaking, the two primary ways to control for method biases are through (a) the design of the study’s procedures and/or (b) statistical controls” (Podsakoff et al., 2003, p. 887). As recommended in procedural remedies, we guaranteed respondents confidentiality and anonymity in our survey. Statistically, we initially used Harman’s single-factor test by loading all measured items in our study into an exploratory factor analysis. Five factors were extracted and none of them accounted for the majority of the covariance among the variables (the highest variance contribution rate was 21.255%), which preliminarily indicated that common method biases were not prominent in our study (Podsakoff & Organ, 1986). However, because Harman’s single-factor test just provided an assessment but did not rule out the effects of common method biases, we also conducted the single-common-method-factor approach. A first-order factor representative of the common method effects was added into our theoretical model. Comparing the modeling fitting indices, we found that the change of CFI, TLI and RMSEA did not exceed 0.02 ($\Delta CFI = 0.02$; $\Delta TLI = 0.02$; $\Delta RMSEA = 0.007$), which further supported that common method biases did not significantly contaminate the observed relationship in our study (Podsakoff et al., 1990, 2003).

4.2. Descriptive statistics

Means, standard deviations, reliability (Cronbach’s alpha), and correlations among key variables are presented in Table 2.

As observed in Table 2, all key variables had acceptable reliability, as all Cronbach’s alphas exceeded 0.9, except COVID-19 based informational cyberloafing with a coefficient of 0.782. COVID-19 based informational cyberloafing was significantly positively related to job anxiety, state gratitude, perceived meaning of work and innovation performance. The perceived meaning of work was negatively associated with job anxiety while positively associated with state gratitude. Employees’ innovation performance was positively related to their perceived meaning of work. These significant correlations lend preliminary support to our hypotheses.

4.3. Hypotheses testing

4.3.1. Model comparison

Our structural equation model used latent variables. All key variables were represented as latent variables based on the sub scores of the respective scales. Prior to path analysis, we first compared our hypothesized model with other feasible theoretical models by using the change of Chi-square test in order to decide whether the proposed model is optimal (Davvetas et al., 2020). Table 3 presents the results of the model fit and Chi-square comparison. The hypothesized model had excellent model fit ($\chi^2(469) = 1529.252$; $RMSEA = 0.064$; $CFI = 0.920$; $TLI = 0.911$), while the alternative model I (added the direct path

between COVID-19 based informational cyberloafing and innovation performance) significantly better fit the data than the hypothesized model ($\Delta\chi^2 = 7.566$, $\Delta df = 1$, $p < 0.01$). Given the alternative model I is best-fitting and relatively parsimonious of all the models, we used it for structural path analysis, which includes all of our proposed paths.

4.3.2. Path analysis

Fig. 2 depicts the path model that illustrates the direct effects results. The structural equation model has considered the effects of control variables on the exogenous variables (see Table 4). To test the indirect effects, bootstrapping analyses were performed 10,000 times to construct the bias-corrected bootstrap confidence interval. The indirect effects exist when the coefficients are significant and the bias-corrected bootstrap confidence interval does not contain zero. Detailed information on the direct and indirect effects is in Table 5.

H1a, H1b and H1c were supported as there were significant positive relationships between COVID-19 based informational cyberloafing and job anxiety ($\beta = 0.467$, $p < 0.01$), state gratitude ($\beta = 0.380$, $p < 0.01$) and perceived meaning of work ($\beta = 0.268$, $p < 0.01$). Additionally, perceived meaning of work positively predicted innovation performance ($\beta = 0.623$, $p < 0.01$), which lends initial support for the indirect effect mediated by perceived meaning of work. H2 was further supported because the indirect effect of COVID-19 based informational cyberloafing on innovation performance through perceived meaning of work was significant ($\beta = 0.167$, $p = 0.001$, 95% CI: [0.081, 0.270]). As reported in Table 5, COVID-19 based informational cyberloafing was negatively related to innovation performance via job anxiety and perceived meaning of work ($\beta = -0.038$, $p = 0.003$, 95% CI: [-0.070, -0.019]). Likewise, it is significant that state gratitude and perceived meaning of work serially mediated the positive relationship between COVID-19 based informational cyberloafing and innovation performance ($\beta = 0.071$, $p = 0.000$, 95% CI: [0.039, 0.118]). H3 and H4 thus received good support.

Last but not least, we found that COVID-19 based informational cyberloafing had a positive direct effect on innovation performance ($\beta = 0.130$, $p = 0.012$, 95% CI: [0.032, 0.239]).

4.4. Post hoc analysis

Since past research found emotions had significant influences on innovation (De Dreu et al., 2008; Isen et al., 1987; Lin et al., 2014), we performed a post hoc analysis to verify the potential emotion-focused mechanisms. We added two indirect pathways, in which COVID-19 based informational cyberloafing indirectly related to innovation performance via job anxiety and state gratitude respectively, into the structural model. Then we ran an additional test to check the possible mediations of these two typical emotions. However, the results indicated that job anxiety ($\beta = 0.008$, *n. s.*) and state gratitude ($\beta = 0.054$, *n. s.*) were not significantly related to individual innovation performance. Therefore, neither job anxiety nor state gratitude, two typical representatives of negative and positive emotions in the workplace during the

Table 2
Descriptive statistics for study variables.

Variables	Mean	SD	Correlations									
			1	2	3	4	5	6	7	8	9	
1. Gender	.57	.50										
2. Age	32.81	8.34	-.209**									
3. Education	3.08	.76	-.119*	.007								
4. Tenure	5.62	6.08	-.061	.673**	-.058							
5. COVID-19 based informational cyberloafing	3.52	.70	-.028	.088*	-.091*	.113**	.782					
6. Job anxiety	2.60	1.09	.061	-.058	-.065	-.030	.245**	.959				
7. State gratitude	3.86	.81	.020	.082	-.033	.066	.287**	-.015	.918			
8. Perceived meaning of work	3.85	.74	-.108*	.199**	.120**	.129**	.261**	-.157**	.378**	.950		
9. Innovation performance	3.64	.77	-.198**	.182**	.160**	.123**	.268**	-.073	.296**	.617**	.944	

Note. N = 544. *p < 0.05; **p < 0.01 (Two-tailed).

Table 3
Results of model comparisons.

Model and structure	χ^2	df	RMSEA	CFI	TLI	$\Delta\chi^2(\Delta df)$
Hypothesized model	1534.515	471	.064	.920	.911	
Alternative model I (adding a direct path from COVID-19 based informational cyberloafing to innovation performance)	1526.949	470	.064	.920	.911	7.566 (1)**
Alternative model II (adding direct paths from job anxiety and state gratitude to innovation performance)	1529.251	469	.064	.920	.911	5.264 (2) (1)
Alternative model III (adding direct paths from COVID-19 based informational cyberloafing, job anxiety and state gratitude to innovation performance)	1525.126	468	.064	.920	.911	9.389 (3)* 1.823(2) (1)*

Note. N = 544. *p < 0.05, **p < 0.01.

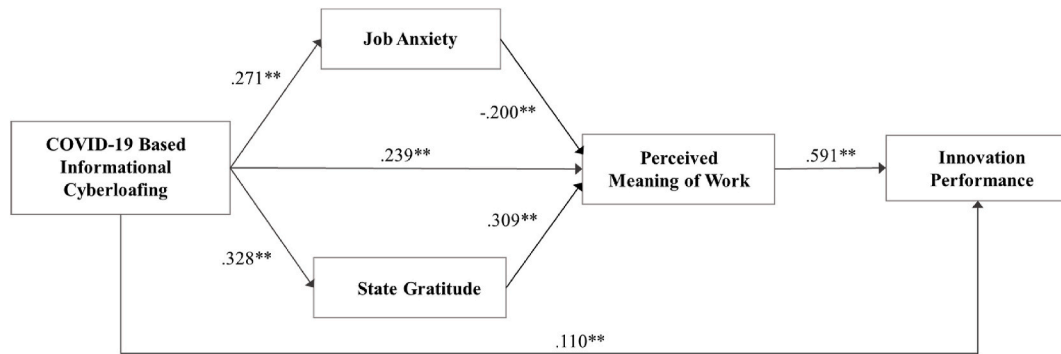


Fig. 2. Results of structural equation model, Note. *p < 0.05, **p < 0.01. All the coefficients were standardized.

Table 4
Coefficients of control variables.

	Job anxiety	State gratitude	Perceived meaning of work	Innovation performance
Gender	0.046	.040	-.058	-.120**
Age	-0.064	.074	.145**	.014
Education	-0.038	.005	.137**	.088*
Tenure	-0.01	-.012	-.010	.023

Note. N = 544. *p < 0.05, **p < 0.01. All the coefficients were standardized.

COVID-19 pandemic, was a mediator in isolation.

5. Discussion

Based on the COR theory, we theorized that COVID-19 based informational cyberloafing has double-sided effects on innovation performance via employees' emotions (job anxiety and state gratitude) and cognitions (perceived meaning of work). As we predicted, on one hand, COVID-19 based informational cyberloafing impairs innovation performance by worsening employees' job anxiety and reducing their perceived meaning of work. On the other hand, COVID-19 based informational cyberloafing enhances innovation performance by increasing employees' state gratitude and strengthening their perception of work

Table 5
Results of structural equation model.

	Effect	P-Value	Lower 2.5%	Lower 5%	Upper 5%	Upper 2.5%	
Simple paths							
COVID-19 based informational cyberloafing → Job anxiety	.467	.000	.295	.323	.628	.662	
COVID-19 based informational cyberloafing → State gratitude	.380	.000	.237	.259	.516	.544	
COVID-19 based informational cyberloafing → Perceived meaning of work	.268	.000	.133	.155	.395	.421	
Job anxiety → Perceived meaning of work	-.130	.000	-.191	-.182	-.080	-.071	
State gratitude → Perceived meaning of work	.299	.000	.195	.213	.390	.405	
Perceived meaning of work → Innovation performance	.623	.000	.512	.529	.727	.751	
	Effect	P-Value	Lower 2.5%	Lower 5%	Upper 5%	Upper 2.5%	Proportion in total effects
Indirect effects							
COVID-19 based informational cyberloafing → Perceived meaning of work → Innovation performance	.167	.001	.153	.173	.443	.476	50.45%
COVID-19 based informational cyberloafing → Job anxiety → Perceived meaning of work → Innovation performance	-.038	.003	-.099	-.089	-.019	-.015	11.48%
COVID-19 based informational cyberloafing → State gratitude → Perceived meaning of work → Innovation performance	.071	.000	.009	.015	.122	.136	21.45%
Total indirect effects	.200	.000	.169	.187	.447	.480	60.42%
Direct effect	.130	.012	.014	.05	.382	.424	39.27%
Total effect	.331	.000	.277	.313	.727	.778	

Note. N = 544. Number of bootstrap samples for calculating bias-corrected bootstrap confidence intervals: 10,000.

meaningfulness. We also found a positive direct effect of COVID-19 based informational cyberloafing on innovation performance.

5.1. Theoretical implications

Our study sheds light on *how* and *why* cyberloafing influences employees' innovation performance. Previous research has put forward a positive direct relationship between cyberloafing and innovative work behavior without theorizing and testing the intervening mechanisms (Derin & Gökçe, 2016). As there is a growing consensus that cyberloafing has mixed effects for work, our study suggests the impact of cyberloafing on innovation is much more complex than simply facilitating it. Building on the COR theory (Hobfoll, 2001, 2011), as well as focusing on two critical resources of emotional and cognitive resources in the COVID-19 context, our study reveals that COVID-19 based informational cyberloafing is not only a blessing but a curse for innovation performance because it might cause both a resource gain spiral and a resource loss spiral. That is, COVID-19 based informational cyberloafing replenishes individuals' emotional resources by invoking their state gratitude, which sequentially leads to an ongoing accumulation of cognitive resources (strengthened perceived meaning of work) and thus advances innovation performance. Meanwhile, cyberloafing might deplete employees' emotional resources by increasing their job anxiety which then reduces their cognitive resources (weakened perceived meaning of work), which in turn hinders innovation. With the "resource lens", we identified a *paradox* in the relationship between COVID-19 based informational cyberloafing and innovation performance, which advances our understanding of how cyberloafing relates to innovation.

In addition, the finding is notable because we first examined the consecutive effects of emotions and cognitions with an integrated approach and offered a detailed explanatory framework for the influences of cyberloafing. This perspective is significant because individuals' cognitive-affective units are a series of connected, interactive and dynamic mediating processes that explain various situation-behavior relationships (Mischel & Shoda, 1995). Positive and negative emotions affect individuals' actions through shaping cognitions and thoughts (Fredrickson, 1998, 2001; Fredrickson & Joiner, 2002; Garland et al., 2010). In this study, through identifying the process of emotional and cognitive resource change, we formed a dynamic and holistic view on its complicated effects, which extends our knowledge on the connection between cyberloafing and innovation performance and answers the calls for more attention to the specific mechanisms of cyberloafing's complex effects (Holland & Bardeel, 2016; Lim & Chen, 2012).

Furthermore, our research advances the extant literature on the outcomes of cyberloafing and provides evidence for the COR theory. Prior studies mainly focused on the antecedents rather than the outcomes of cyberloafing (e.g., Aghaz & Sheikh, 2016; Andel et al., 2019; Koay, 2018; Pindek et al., 2018). This study enriches the proximal and distal outcomes of cyberloafing by testing the effects of cyberloafing on emotions (job anxiety and state gratitude), cognitions (perceived meaning) and behaviors (innovation). The positive synergistic and direct effect of COVID-19 based informational cyberloafing on innovation performance provides more evidence that cyberloafing is a desirable source of innovation. The COVID-19 pandemic has damaged employees' mental health and well-being, and has brought disruptions and challenges at work (Graf-Vlachy et al., 2020; Jahanshahi et al., 2020; Zhang, Wang, et al., 2020), which represents the context of resource loss. When resource loss circumstances are high, resource gain would have much greater value for individuals. That is, resource gain effects are more prominent when individuals are highly stressful in the face of actual or future resource loss. The overall positive effect we found in this study proves the *gain paradox principle* in the COR theory (Hobfoll et al., 2018).

Last but not least, this research opens up a new avenue to study the

antecedents of perceived meaning of work. Perceived meaning of work can be viewed as an important intrinsic motivation, which encourages innovation. As shown in our hypothesis testing results and post hoc analysis, perceived meaning of work is a predictor of innovation performance and the relationships between emotions and innovation performance were fully mediated by it, which highlighted the value of perceived work meaningfulness for innovation. Given the importance of perceived meaning of work, knowing what might predict it has received considerable attention. Previous studies have examined antecedents including individual traits (e.g., Allan et al., 2016), job characteristics (e.g., Allan, 2017; Schnell et al., 2013; Tims et al., 2016), and contextual factors (e.g., Arnold et al., 2007; Schnell et al., 2013; Wang & Xu, 2019). While work attitudes might relate to workplace behavior (e.g., Aubé et al., 2009; Boddy, 2014; Lim et al., 2008; Mount et al., 2006), there is a lack of knowledge on the relationship between employees' discretionary workplace behavior and their perceived meaning of work.

Our results indicated that COVID-19 based informational cyberloafing builds up employees' perceived meaning of work because it provides employees with a learning channel to broaden their knowledge about the COVID-19 crisis, and then relate their work more to the social values as well as themselves more to their work, and finally deepen their interpretation of their work meaningfulness. We also found that emotion mediates the association between COVID-19 based informational cyberloafing and perceived meaning of work. That is, emotions can be a predictor of perceived meaning of work. Perceived meaning of work embodies employees' view on their job and the cognition of how they connect with their job, which can be shaped by their actual work situations and experiences, including their behaviors and feelings at work. These findings are noteworthy because this is the first study to examine how employees' discretionary workplace behaviors shape their perceived meaning of work and to find the intermediary effects of emotions in the behavior-attitude link.

5.2. Practical implications

The COVID-19 pandemic has broadened the use of the internet and smart devices at work, which is a topical issue in business management practice and research. The findings on the positive effects of COVID-19 based informational cyberloafing on gratitude, perception of work meaningfulness and innovation performance are illuminating for organizational management and readjustment in public health pandemics. In addition, as shown in our findings, COVID-19 based informational cyberloafing has paradoxical effects, as it also brings higher job anxiety and thus impairs employees' perception of work meaningfulness and innovation performance. Given that, open and flexible measures are suggested to manage employees' cyberloafing behaviors.

On one hand, employees should be allowed more autonomy and flexibility in internet use. Rational cyberloafing can be used as a motivational and managerial tactic for emotional refreshment and work status adjustment in stressful situations like the COVID-19 pandemic. On the other hand, reasonable monitoring and restriction, such as norms, rules and regulations to caution employees about the potential detriments of excessive cyberloafing and provide guidance on timing of internet use, are indispensable to manage cyberloafing. In summary, managers should consider the effects of cyberloafing holistically, allowing cyberloafing to activate employees while restricting it appropriately to avoid loss caused by abuse or addiction.

5.3. Limitations and future research

We acknowledge some limitations of the study. First, we relied on subjective self-assessment, cross-sectional data to address the issue of cyberloafing. Cyberloafing is hidden and fragmented, so it is hard to measure. Anxiety, gratitude and the meaning of work are all intrinsic perceptions of employees. For some tasks, innovation is difficult to define by objective indicators. As a consequence, we used self-rated data

in this study. The convergent, discriminant, construct validity and common method variance of self-report measures in our study are acceptable, which supports our hypotheses testing. But cross-sectional data may not guarantee the causality in our research model. Due to the mediating mechanisms of emotions and cognitions, there might be time lags in the chain effects of cyberloafing on innovation performance. Zacher et al. (2014) examined the short- and long-term effects through a diary study, which captured the within- and between-person difference. Future research may use a longitudinal research design to more comprehensively understand the cyberloafing–performance relationship.

Second, even though our study reveals the conflicting cyberloafing–innovation linkages by introducing emotion-and-cognition-mediated mechanisms, there might be both more immediate and distant outcomes that can explain how cyberloafing affects employees and organizations. Future research should investigate various meaningful work-related consequences at the organization level, group level and individual level, including work attitudes, work behaviors and well-being, to depict cyberloafing effects through an integrated approach combining both positive and negative perspectives.

We did not test any boundary condition of the effects of cyberloafing on innovation performance. There might exist some possible moderators that influence the effect size and direction of cyberloafing. For example, cyberloafing might cause fewer negative emotions for employees in an organic organization than employees in a mechanistic organization (Kessler et al., 2017). Cyberloafing might have more positive effects on knowledge-based enterprises than on manufacturing enterprises. Future research should explore the boundaries of the possible effects of cyberloafing on outcomes, such as organizational flexibility and organizational patterns.

Finally, focusing on COVID-19 based browsing behaviors makes our research specific to the emerging context, but might lessen the generality of our results. Although browsing activities is the most common form of cyberloafing (Blanchard & Henle, 2008), there are still other types of cyberloafing including online communication (e.g., checking personal emails and online chatting), watching videos, listening to music, shopping online, and even online gambling or visiting illegal websites (Blanchard & Henle, 2008; Lim & Teo, 2005; Van Doorn, 2011). Cyberloafing is multi-dimensional, so different forms of cyberloafing might bring different utility (Van Doorn, 2011). Therefore, specifying cyberloafing as browsing COVID-19 based information might

limit the generality of our results. Future research can explore the effects of other types of cyberloafing, such as social cyberloafing and recreational cyberloafing.

6. Conclusion

The study contributes to theory development by empirically showing that cyberloafing is a mixed blessing for innovation performance during the COVID-19 pandemic. Based on the COR theory, we examined the underlying mechanisms of COVID-19 based informational cyberloafing on innovation performance via job anxiety, state gratitude and perceived meaning of work. Our results have both academic and practical implications for employees’ psychological and behavioral management in the stressful situation of the COVID-19 pandemic. We encourage future research to provide more insights into the outcomes of cyberloafing and its potential mechanisms in various contexts.

Credit author statement

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Appendix

The Measure Items of COVID-19 Based Informational Cyberloafing.

Item	
1	Visit news sites to follow the progress of COVID-19 prevention and control released by the authorities (e.g., real-time data, scientific research progress, and material supply).
2	Visit financial websites/apps to get up-to-date information from the stock market and global trade, paying attention to the impact of the COVID-19 pandemic on economy.
3	Visit shopping websites/apps to follow the supply and purchase information about epidemic prevention materials (such as protecting masks and disinfection supplies).
4	Browse public opinion (e.g., ineffective government work, suffering situations of patients, etc.) through various social media platforms (e.g. WeChat, Weibo, etc.)
5	Pay close attention to the recovery of social life from pandemic including the resumption of work, transportation, tourism, etc.)
6	Follow the pandemic information through mobile phone/PC at working hours every day during the COVID-19 pandemic.

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