STRATEGIES IN ADDRESSING PSYCHOLOGICAL INJURIES AT WORK IN ECONOMICALLY TRANSITIONING SOCIETIES

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STRATEGIES IN ADDRESSING PSYCHOLOGICAL INJURIES AT WORK IN ECONOMICALLY TRANSITIONING SOCIETIES

Topic Editors:
Wei Guo, Nanjing University, China
Youqing Fan, Western Sydney University, Australia
Bingqin Li, University of New South Wales, Australia

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Work-Related Mental Health Under COVID-19 Restrictions: A Mini Literature Review

Wei Liu[1], Yingbo Xu[1] and Danni Ma[2]*

[1] *Business School, Qingdao University, Qingdao, China,* [2] *UTS Business School, University of Technology Sydney, Ultimo, NSW, Australia*

Coronavirus Disease 2019 (COVID-19) restrictions, including national lockdown, social distancing, compulsory quarantine, and organizational measures of remote working, are imposed in many countries and organizations to combat the coronavirus. The various restrictions have caused different impacts on the employees' mental health worldwide. The purpose of this mini-review is to investigate the impact of COVID-19 restrictions on employees' mental health across the world. We searched articles in Web of Science and Google Scholar, selecting literature focusing on employees' mental health conditions under COVID-19 restrictions. The findings reveal that the psychological impacts of teleworking are associated with employees' various perceptions of its pros and cons. The national lockdown, quarantine, and resuming to work can cause mild to severe mental health issues, whereas the capability to practice social distancing is positively related to employees' mental health. Generally, employees in developed countries have experienced the same negative and positive impacts on mental health, whereas, in developing countries, employees have reported a more negative effect of the restrictions. One explanation is that the unevenly distributed mental health resources and assistances in developed and developing countries.

Keywords: COVID-19 restrictions, work-related mental health, employees, developing and developed countries, social distancing, remote working

INTRODUCTION

The COVID-19 pandemic has raised dramatic changes in the working landscape worldwide. The governments and organizations have implemented a series of emergency packages, such as mandatory lockdown, social distancing, and quarantine, to curb the coronavirus from further spreading and emergency measures on physically resuming to work after the lockdown. Besides, a vast majority of employees have also switched immediately to working from home, known as "teleworking," "remote working," or "smart working" (1), responding to the directives of their organizations. Working under these restrictions produces unprecedented challenges to employees, among which is to adapt to the abrupt shifts in working conditions quickly. Even though they are, to a large extent, physically protected, concerns about their mental health have sharply arisen in the extant literature (2).

The phenomenon of implementing COVID-19 restrictions is novel to the research disciplines of both organization studies and public health. Notably, as a containment strategy to prevent employees from physical harm, the implementation of COVID-19 restrictions unexpectedly brings

up mental health issues on them. For example, some employees are found experiencing higher psychological distress (e.g., a negative dimension of mental health) following the work-from-home (WFH) guidelines of their organizations (3, 4). However, the complex impact of applying COVID-19 restrictions on work-related mental health is largely understudied compared to the vast majority of literature focusing on the impact of the outbreak of COVID-19 (5). Besides, in contrast to the tremendous psychological problems derived from the COVID-19 pandemic (6), the psychological impact of COVID-19 restrictions remains unclear. Extant literature presents mixed findings on the impact of COVID-19 restrictions on mental well-being (7). Even though the COVID-19 restrictions have placed strain on different cohorts (8), we suggest paying more attention to employees—a representative group experienced both national and organizational restrictions during the pandemic. The restriction-induced job insecurity and financial hardship add more challenges and are likely to escalate some psychological symptoms further (9). Consequently, our research is concerned about how the responses of governments and organizations to the COVID-19 pandemic affect employees' mental health.

The purpose of this mini-review is to examine the psychological impact of the various epidemic-related restrictions on employees. To this end, we systematically select the studies regarding employees' mental health under national-level restrictions, such as mandatory lockdown, quarantine, social distancing, resuming to work, and teleworking guidelines of companies or public organizations (e.g., public schools). The various restrictions may lead to different psychological impacts due to their inherent differences. The review identifies the variety of COVID-19 restrictions and the associated psychological impact on employees. In contrast to the primary concentration on healthcare workers or general populations, we argue that employees should be a chief concern as their mental well-being is strongly associated with economic development and labor cost to society (10).

The review contributes to understanding the impact of emergency measures (e.g., COVID-19 restrictions) on work-related mental health. Chiefly, we categorize various COVID-19 restrictions and their psychological impact on employees. In doing so, the review straightforwardly presents the consequences of the various restrictions on the work-related mental health of employees. Additionally, the review documents evidence from diverse countries to track the influence of specific restrictions on employees' mental health and statistically analyses the variations on each epidemic-related restriction's impact in developed and developing countries. The review responds to the call for attention on employees' mental well-being associated with the health emergencies at the workplace during the COVID-19 pandemic (11). More importantly, the review suggests practitioners (e.g., managers, policymakers) fully consider the complexity and consequences of applying COVID-19 restrictions. Timely mental health support is urgently needed to assist employees who have been psychologically struggling under the ongoing implementation of COVID-19 restrictions.

METHODS

For a wide-ranging and disciplined collection of the literature on employees' mental health and COVID-19 restrictions, we performed systematic literature searching for the relevant articles. The search scope comprises four factors: time span, keywords, language, and databases. Primarily, we selected articles in the English language, and published between January 2020 and August 2021. The combined terms of "COVID-19 restrictions," "employees" or "workers," and "mental health" or "psychological well-being" are used as the keywords searching in the databases "Web of Science" and "Google Scholar."

The initial search resulted in the identification of 177 related articles. Article selection was conducted by two authors in an independent manner. The first round of manual screening is based on article title and abstract. We excluded the non-empirical research, narrative literature reviews, and the articles without considering COVID-19 restrictions and employees' mental health. Besides, the research that exclusively focuses on healthcare workers is also excluded. The disputes on the inclusion of each article were jointly discussed and solved with the contribution of all co-authors. The first round of screening resulted in 61 articles. Sequentially, the author proceeds to extensive reading of the introduction and conclusion of these articles. Finally, 37 articles have been excluded from the review because their focuses have no relation to the review topic. In the end, 24 highly relevant research articles have been confirmed. The literature selection strategy was visualized in **Figure 1**.

RESULTS

The findings cover four government responses, including national lockdown, resuming to work with approval, social distancing, mandatory quarantine, and a broadly used organization response in many industries—remote working. We separate remote working from other national restrictions for two reasons. Primarily, remote working as an organizational work arrangement has emerged prior to the pandemic (13). Second, remote working does not apply to the general workforce as the other government responses do. For example, grocery retailers, restaurant employees do not apply to the remote working guidelines. It is only workable for certain groups of the workforce who can manage their work flexibly with no restrictions to location.

National-Level Restrictions

COVD-19 restrictions are a series of non-pharmaceutical measures carried out to prevent the spread of the virus. Governments worldwide have declared strict national-level measures to prevent transmission of the coronavirus. The findings reveal that among those country-level health emergencies, mandatory lockdown, quarantine, social distancing, and resuming to work are recognized as highly associated with the psychological impact of employees.

FIGURE 1 | Literature search strategy, following PRISMA flow diagram (12).
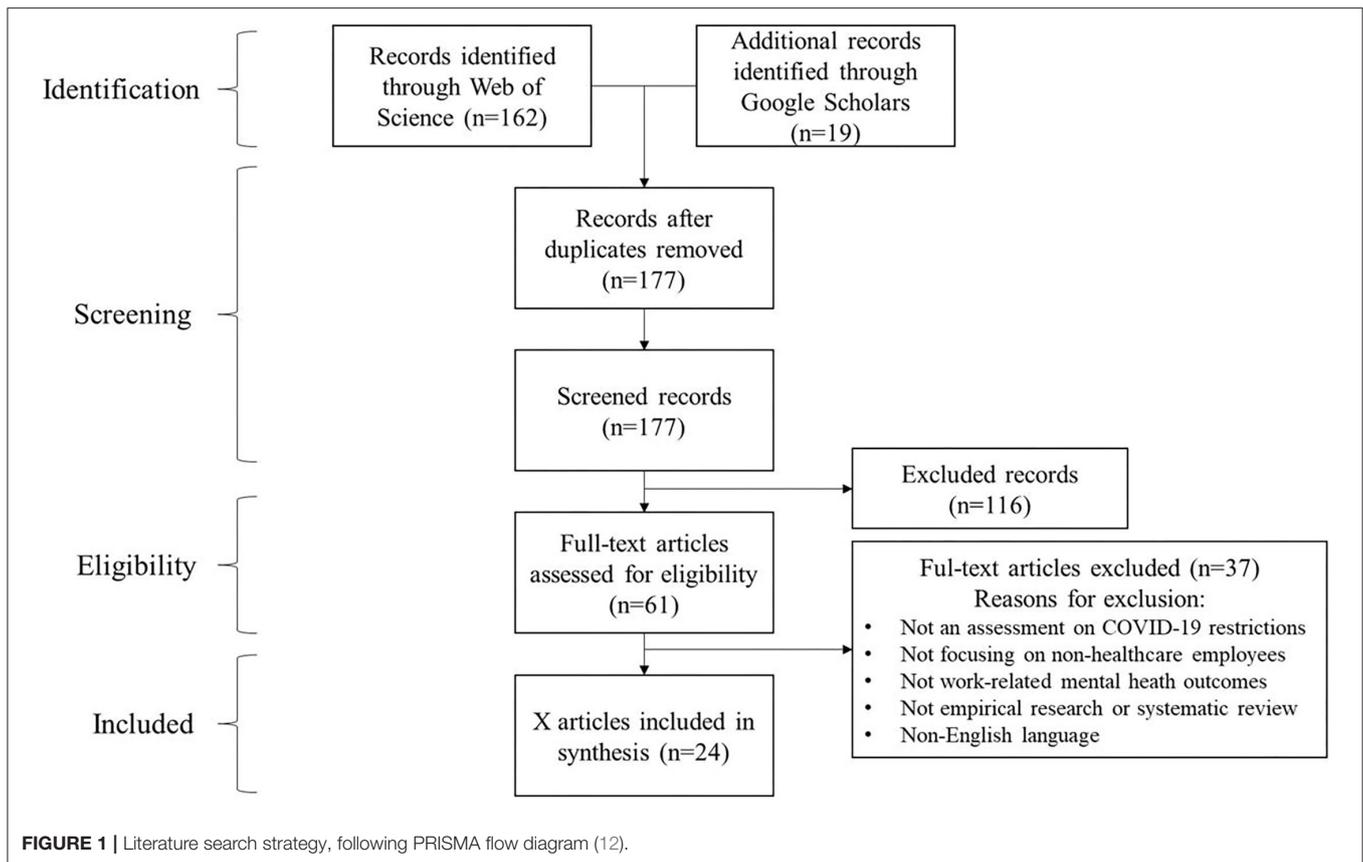
Lockdown

Scholars describe nationwide lockdown as at the forefront of various restrictions, that is, through measures like closing non-essential businesses, limiting public transportation. Lockdown has proven effective in suspending the spread of the coronavirus but at the expense of psychological effects (14).

Both negative and positive psychological impacts of national lockdown are reported in the reviewed studies. Apouey et al. (15) have found that gig economy workers, especially food delivery bikers, are less stressed during the lockdown due to their working conditions, allowing them to keep physical activities and enjoy the beautiful urban view delivering food to customers. In contrast, drivers, also as gig economy workers, show no significant increase in anxiety and stress during the national lockdown in France. Abbas et al. (16) also report reduced stress of employees during the lockdown in Pakistan. Nevertheless, the studies carrying out in developing countries (i.e., Indian) show more negative psychological reactions than positive outcomes. The sudden changes in the routine of working and living lead to employees' psychological stress, social disconnectedness, a sense of loneliness in Indian (17), and depression in Pakistan (18).

The underlying reasons for employees' mental health issues are primarily due to the lockdown-induced fear of job insecurity (16), financial losses (17), and excessive exposure to misinformation while using social media to keep social connections (18). Therefore, scholars suggest several practical interventions, such as social support, timely and sufficient mental health assistance, to mitigate the emerged psychological symptoms during the lockdown period (16, 17).

Resuming to Work

Due to effective control of the pandemic, a growing number of employees in many countries have been physically attending to the workplace. In China, part of the workforce has resumed work after seeking approval from the government since the ending of an extended nationwide lockdown on February 10, 2020 (19). By June 2020, many states in the U.S. also allowed restaurants to reopen and employees resuming work (20). Around the same time in Bangladesh, some financial institutions are permitted to operate with limited hours (21).

Surprisingly, the easing restrictions are more associated with adverse psychological reactions. Employees show psychological symptoms, including psychological distress (3, 21, 22), depression, anxiety, stress, worries, insomnia, somatization (19, 20, 23), and emotional reactions (24). Scholars have found that the fear of contracting the coronavirus is the chief concern of employees, especially those who cannot avoid face-to-face interactions during work (e.g., bank employees, restaurant workers, teachers) (3).

Nevertheless, workplace measures, such as workplace hygiene and indoor mask mandates (19, 22, 23), are important to influence employees' mental health conditions. Scholars report

strong evidence that the deficiency of workplace measures is associated with higher stress levels of employees (23), especially for the frontline workforce, including bank employees (21), school teachers (24), and restaurant workers (3). On the contrary, sufficient and clear workplace guidelines can vastly reduce the psychological distress of the workforce (19, 22). Besides, social support is also essential to release employees' worry about unemployment (20). Bufquin et al. (3) report that furloughed or unemployed individuals has experienced a lower level of psychological distress than working employees in the restaurant industry in the U.S. because they received social support (e.g., financial compensation, tax credits) from the federal government.

Employees' mental health conditions show more negative than positive consequences under the easing of restrictions. Studies carried out in developed countries (i.e., USA, Demark, Japan) show two adverse outcomes (2/7 articles) and one positive outcome (1/7 articles); in contrast, studies in developing countries (i.e., China, Bangladesh) show three adverse outcomes (3/7 articles) and one positive outcome (1/7 articles).

Social Distancing

Social distancing is also a national measure to avoid gathering among people during the pandemic. Scholars suggest that social distancing has generated net social benefits of $5.16 trillion to curb coronavirus transmission in the U.S. (25). Scholars also call attention to the psychological effect of implementing social distancing nationwide (26). In a recent study, Lan et al. (27) report that social distancing can ease the depression and anxiety of employees in the grocery retail industry, where the likelihood of close contact with other people is high.

Quarantine

Governments worldwide have imposed various quarantine restrictions for different groups of individuals during the pandemic. For example, individuals with positive COVID-19 tests are isolated in hospitals (28); international travelers are compulsorily quarantined in designated hotels for 14 days after entry to a country (29). Most quarantine-related studies are concerned about the psychological impact on vulnerable groups, including healthcare workers, children and older adults (30). Teng et al. (31) investigate the employees who are working in the designated hotels for quarantine accommodation, finding that that the quarantine hotel employees have experienced mental health burden due to the augmented risk of contact guests suspected to have or infected by COVID-19 and the increased workload of operating a quarantined hotel.

Organizational-Level Restrictions

Apart from the government mandates, teleworking, as a prominent measure initiated by many companies and organizations, also places strain upon employees' mental well-being (32).

Remote Working

Remote working is not a new phenomenon for employees and companies (13). As a working practice for some professionals

to voluntary work offsite from the office, remote working initially attempts to provide flexible work-life arrangements (7). Compared to conventional telework, pandemic-induced remote working is mandatory in nature (33), and companies and organizations have never before enforced employees to work full time at home simultaneously in a global range (32). On the one hand, using telecommunication devices to complete work has significantly minimized the risk of spreading the virus through regular close contact with others (4). On the other hand, as a growing phenomenon, employees' psychological reactions to remote working emerge as a fundamental problem (4).

Scholars report psychological symptoms induced by remote working during the pandemic ranging from stress, emotional distress, emotional exhaustion, and anxiety to depression (4, 32, 34). Employees' mental health issues are associated with their perceptions of the pros and cons of telework. The acknowledged advantages of teleworking include saved commuting time, flexible working conditions, and lower risk of COVID-19 infection, whereas the dark sides are technical issues, blurred work-life boundaries, distractions, and social disconnection (7, 35). In contrast to the general employees, some groups of employees are more easily to develop negative perceptions than positive ones, such as autistic employees (35), teachers, and university employees (7, 36), due to the challenges of adaptation to teleworking.

On top of that, the strict management control and monitor (32), deteriorated work engagement (37), and excessive job demand (34) can aggravate employees' mental health psychological symptoms during remote working. Also, employees in developed countries (i.e., Italy, Finland, Germany, U.S., Canada, Norway, U.K., and Australia) report similar positive (4/11 articles) and negative (3/11 articles) psychological impacts. In contrast, those in developing countries (i.e., Israel, Egypt, Indonesia, Chile) show more negative (3/11 articles) psychological impacts of remote working.

A more specific description of these included articles is shown in **Table 1**.

DISCUSSION

The review aimed to address the influence of the implementation of COVID-19 restrictions on employees' mental health. The results show that COVID-19 restrictions can have both negative and positive psychological impacts on employees. The underlying reason for the increased psychological well-being of employees is primarily associated with the minimized fear of contracting the virus. In contrast, the mild to severe psychological symptoms induced by implementing these restrictions arise due to multiple reasons ranging from individual, practical, to social factors.

First, some employees are found more likely to experience deteriorated mental health than others during the restrictions. For example, autistic employees are more vulnerable to the disadvantages of remote working than its advantages (35). Similarly, some frontline workers (except healthcare workers in this review) such as quarantine hotel employees, bank employees, teachers, and university employees show

TABLE 1 | Description of included articles.

Level of COVID-19 restrictions	COVID-19 restrictions	Work-related mental health	Country	Factors considered	Main results	Methods	Population setting/N (if available)	References
Organizational level	Remote working	Emotional distress	Israel	Perceived advantage/ disadvantage of telework	Autistic employees show a marginally significant deterioration in their mental health because they are more vulnerable to the disadvantages of remote working than the advantages	Mixed methods (survey and qualitative interview)	Autistic employees (disadvantaged population in the workforce)/N = 23 (quant), N = 10 (qual)	Goldfarb et al. (35)
		Occupational stress	Italy	Perceived advantage/ disadvantage of telework	The mobile workers show reduced stress due to saved commuting time, flexibility, and work-life balance in teleworking	Cross sectional/phone survey	Mobile workers/N = 51	Moretti et al. (1)
		stress	Italy	Management control	Remote working causes a sudden shift of management controls, including the increased number of digital meetings, more demanding from supervisors and clients, and constraining control, which increases the stress levels of the PSF employees	Field study/interview	PSF employees/N = 15	Delfino and van der Kolk (32)
		Perceived stress	Italy	Perceived advantage/ disadvantage of telework	Teachers are affected most in their mental health comparing the other three professional categories due to the less perceived benefits of teleworking	Cross sectional/online survey	Professional employees (practitioners, managers, executive employees, teachers)/N = 628	Mari et al. (38)
		Emotional exhaustion, psychological well-being	Egypt	Perceived advantage/ disadvantage of telework	Employees developing positive perceptions of remote working have better psychological well-being. In contrast, employees who have negative perceptions of telework show emotional exhaustion	Cross sectional/online survey	Employees/N = 318	Mostafa (7)
		The Depression, Anxiety, and Stress Scale	Indonesia	Reduced pandemic-related uncertainty	Employees show minimal to slight acute depression (18.4%), anxiety (46.5%), and stress (13.1%) during remote working	Cross sectional/online survey	Employees/N = 472	Sutarto et al. (4)
		Psychological distress	Finland	Work engagement	Remote working leads to an increase of psychological distress due to the deterioration in work engagement	Longitudinal/online survey	General employees/N = 965	Oksa et al. (37)

(Continued)

TABLE 1 | Continued

Level of COVID-19 restrictions	COVID-19 restrictions	Work-related mental health	Country	Factors considered	Main results	Methods	Population setting/*N* (if available)	References
		Emotional exhaustion	Germany and USA	Excessive job demand	Excessive job demands in telework lead to employees' emotional exhaustion through the increased number of unfinished tasks	Online survey	Employees in Germany/*N* = 168	Koch and Schermuly (34)
							Employee in the USA/*N* = 292	
		Stress	Canada	Perceived advantage/disadvantage of telework	Employees' stress level is lower due to the reduced risk of exposure to the virus in teleworking	Cross sectional/online survey	General employees/*N* = 459	Parent-Lamarche and Boulet (39)
		Distress, psychosocial well-being, quality of life, loneliness	Norway, UK, USA, and Australia	Perceived advantage/disadvantage of telework	The remote working employees show better mental health conditions than those who were unemployed across the four countries. Employees from Norway show better mental health conditions than those in UK, USA, and Australia due to their preference for teleworking	Cross sectional/online survey	Individuals that were 18 years of age and over/*N* = 3,810	Ruffolo et al. (40)
		Psychological distress (i.e., depression, anxiety, stress)	Chile	Perceived advantage/disadvantage of telework	A majority of university employees have experienced a high level of stress due to the challenges of adaptation to remote working	Cross sectional/online survey	University employees/*N* = 192	Gutierrez and Gallardo (36)
National level	Lockdown	Stress and anxiety	France	Perceived advantage/disadvantage of the lockdown	Drivers show no significant increase in stress and anxiety levels, and bikers even show lower stress levels during the lockdown compared to other precarious workers. Bikers' lower stress is due to the characteristics of their working conditions, such as physical activities and the chance to enjoy the beauty of the urban view	Mixed method (interviews and longitudinal/online survey)	Gig economy workers (i.e., bikers and drivers)/(qualitative respondents/*N* = 94; quantitative participants/*N* = 137)	Apouey et al. (15)
		Psychological well-being, psychological distress	USA	Social support	Working employees have a higher level of psychological distress than furloughed or laid-off employees due to the heightened likelihood of exposure to the virus.	Cross sectional/online survey	Restaurant employees/*N* = 585	Bufquin et al. (3)

(Continued)

TABLE 1 | Continued

Level of COVID-19 restrictions	COVID-19 restrictions	Work-related mental health	Country	Factors considered	Main results	Methods	Population setting/*N* (if available)	References
					Unemployed individuals show no significant difference in psychological well-being than employed due to the government's social support			
		6-item general health questionnaire	Pakistan	Social support	Job insecurity is adverse to employees' mental health when social support is low	Time-lagged field survey	Hospitality employees/*N* = 272	Abbas et al. (16)
		Psychological stress, social disconnectedness, and sense of loneliness	Indian	Mental health assistance	The majority of the respondents have experienced desolation and disconnectedness during the lockdown due to financial losses and blurred work-life boundaries	Qualitative interview	Middle-level employees in private sector organizations/*N* = 22	Varshney (17)
		Depression	Pakistan	Social media usage	The excessive social media usage during social distancing of the pandemic lead to employee depression due to overexposure to misinformation	Longitudinal/online survey	University employees and IT employees/*N* = 267	Majeed et al. (18)
	Returning to working physically at workplace after lockdown	Psychological distress	Bangladesh	Workplace measures, social support	A majority of bank employees are likely to experience a moderate to severe level of psychological distress due to the lack of personal protective equipment when they were returning to work after a national lockdown	Cross sectional/online survey	Private commercial bank employees/*N* = 120	Rana and Islam (21)
		Depression, anxiety, stress, and insomnia	China	Workplace measures	Employees report a low prevalence of mental health issues after returning to work due to workplace measures	Cross sectional/online survey	Employees/*N* = 1,323	Tan et al. (19)
		Anxiety, depression, insomnia, and somatization	China	social support, mental health assistance	Employees show a prevalence of anxiety (12.7%), depression (13.5%), insomnia (20.7%) and somatization (6.6%) after returning to work due to the worry about unemployment	Cross sectional/online survey	Employees/*N* = 709	Song et al. (20)
		Emotional reactions	Demark	Perceived advantage/ disadvantage of telework	Remote-working teachers show higher levels of worry than those teaching at school when they return to teaching physically at school	Cross sectional/online survey	Public school teachers/*N* = 2,665	Nabe-Nielsen et al. (24)

(Continued)

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TABLE 1 | Continued

Level of COVID-19 restrictions	COVID-19 restrictions	Work-related mental health	Country	Factors considered	Main results	Methods	Population setting/*N* (if available)	References
		Psychological distress	Japan	Workplace measures	The number of workplace measures is positively associated with employees' work-related mental health	Cross sectional/online survey	Full-time employees/*N* = 1,448	Sasaki et al. (22)
		Stress and worries	Hong Kong, China	Workplace measures	The deficiency of workplace measures has caused an increase in employees' stress levels	Cross sectional/online survey	Employees/*N* = 1,049	Ho et al. (23)
	Social distancing	Depression and anxiety	USA	Workplace measures, mental health assistance	Grocery retail employees who can practice social distancing at the workplace have experienced low anxiety and depression	Cross sectional/on site survey	Grocery retail employees/*N* = 104	Lan et al. (27)
	Quarantine	The Depression, Anxiety, and Stress Scale	China	Workplace measures, mental health assistance	During the pandemic, the temporary quarantine accommodation restrictions harmed the mental health of quarantine hotel employees in China due to the augmented risk of contact guests suspected to have or infected by COVID-19 and the raised workload of operating a quarantined hotel	Survey	Quarantine hotel employees/*N* = 170	Teng et al. (31)

psychological symptoms resuming to work due to the challenges of increased risks of contracting the virus (21, 24, 31). In contrast, gig economy workers, especially food delivery bikers, have lower stress during the lockdown due to the chance to do physical activities and enjoy the beautiful urban view while working (15). These findings suggest that the psychological reactions of vulnerable employees and frontline employees are more intense than others.

Second, this mini-review highlights several practical factors, including workplace measures and management practices, essential to mental health under COVID-19 restrictions. For example, deficiency of workplace measures undermines employees' mental health, leading to psychological symptoms such as stress and worries (23), depression, anxiety, stress, and insomnia (19). In contrast, clear and comprehensive workplace guidelines can reduce employees' psychological distress (22). Similarly, strict management control and excessive job demand during teleworking can lead to emotional exhaustion (34) and stress (32). Also, reduced work engagement during teleworking can cause employees' psychological distress (37).

Besides, in line with other studies (11), this mini-review also presents the importance of social factors in mitigating or exacerbating employees' psychological reactions under implementing COVID-19 restrictions. In this regard, social support, such as financial support programs, can prevent symptoms of psychological distress, especially for furloughed or dismissed employees during the pandemic (3). Similarly, psychological support programs, such as online mental health assistance or counseling, are helpful to alleviate the psychological issues of employees. The review suggests that sufficient social support, both financially and psychologically, plays an essential role in safeguarding employees' mental health during implementing COVID-19 restrictions.

Additionally, the studies reviewed consistently report more adverse impacts on employees' mental health than positive effects. Consistent with Flores et al. (41), our mini-review suggests that regardless of the success of cubing the spread of COVID-19, public health restrictions must be coupled with the efforts to shape proper interventions managing its psychological impacts on employees. The adverse outcomes are evident when it comes to compare and contrast with the data sourced countries. In 24 reviewed articles, studies conducted in developed countries report six negative and positive impacts, respectively, in contrast to 10 adverse outcomes of the research in developing countries. One plausible explanation is the lack of online mental health care resources in developing countries (42).

CONCLUSION

Despite the recent growth of this field, attention to the psychological impacts of COVID-19 restrictions remains low in contrast to the primary concentration on the effect of the pandemic *per se*. Most studies are mainly concerned about the general population rather than employees (11), and research exhibiting employees' psychological reactions toward various COVID-19 restrictions is still limited. Based on the available 24 articles focusing on several pandemic restrictions, namely, national lockdown, resuming to work, social distancing, quarantine, and remote working, our mini-review reveals more adverse psychological impacts than positive ones on employees, especially in developing countries. We suggest that proper interventions must be arranged to safeguard employees' mental health.

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A Scale to Measure the Joy in Work of Doctors: Development, Validity, and Reliability

Zemiao Zhang, Yinhuan Hu*, Hao Chen*, Weilin Zhu, Dehe Li, Ximin Zhu, Xiaoyue Wu and Jiayi Li

School of Medicine and Health Management, Tongji Medical College, Huazhong University of Science and Technology, Wuhan, China

Background: The aim of this study is to develop a scale and evaluate its' validity and reliability to measure the joy in work of doctors.

Methods: Based on literature review and panel discussion, the scale framework and item pool were determined. Next, the items were modified by two rounds of expert consultation. Then the pre-investigation was applied and the formal version of scale was formed. Last, the reliability and validity of the scale were tested with 426 physicians.

Results: The scale was composed of four dimensions: work autonomy needs, competency identification needs, competency perception needs and work relationship needs. Each dimension had 7 items, and both reliability and validity were acceptable. The Cronbach α coefficient and half-reliability coefficient of the whole scale were 0.954 (>0.9) and 0.974 (>0.9). The Spearman correlations of item-total score ranged from 0.556 to 0.749, indicating a good-item total score correlation. The χ^2/df, RMSEA, RMR, GFI, CFI, and TLI, CFA of the maximum likelihood method supported a good fit with the model.

Conclusions: Based on the self-determination theory, this study develops a scale to measure the joy in work of doctors. It has good validation and reliability, which is useful for doctors and medical institutions to take steps to improve happiness.

Keywords: doctors, joy in work, scale, reliability, validity

INTRODUCTION

The mental health of healthcare workers has come under renewed attention during the COVID-19 pandemic. The proportion of doctors who felt panic, helplessness, loneliness, fatigue, mental distress, anxiety and depression increased significantly due to the negative impact of work stress and patient outcomes (1–3). A research in Wuhan showed that the percentage of depression, anxiety, insomnia and pain of front-line medical staff were 50.4, 44.6, 34.0, and 71.5%, respectively (2). A systematic review of 13 studies from the UK revealed that the prevalence of anxiety, depression, and insomnia was 23.2, 22.8, and 38.9%, respectively (4). In this case, the mental health of medical staff has become a priority in the world. Three ministries in China (National Health Commission, Ministry of Human Resources and Social Security, Ministry of Finance) jointly issued a document pointing out that "Psychological crisis intervention should be strengthened to relieve the psychological pressure of medical personnel" (5).

In fact, the psychological problems of clinicians have been paid attention for a long time. With the rapid development of medical technology and aggravation of work challenges, doctors tend to have low job satisfaction (6, 7). A meta-analysis of 9,302 doctors showed that the prevalence of professional burnout among Chinese doctors ranged from 66.5 to 87.8%, especially for those aged 30–40 years old (8). Another survey found that staff turnover among physicians has increased sharply in recent years, with 60% considering leaving (9). According to 2018 British Medical Association online survey, as doctors work longer hours, they are more likely to suffer from emotional disorders (10). A large number of studies have shown that stressful working conditions of doctors not only adversely affect individual health, but also endanger patient safety and medical quality (11).

In this case, the Institute for Healthcare Improvement (IHI) and Johnson Foundation proposed that we should think about how to improve fun at work rather than how to solve mental problems (12). In their view, concentrating on negative emotions can cause people to magnify problems rather than solve them. Slaughter first defined "fun" in the field of psychology as an expression of individual quality of life that can be achieved through intellectual activity, behavioral activity, and emotional experience (13, 14). Lamm insisted that work fun is social, interpersonal and entertaining (15). In addition, work pleasure is often related to efficiency and achievement (16, 17). By focusing on the joy of the physician's work, it inspires key resources such as care, compassion, and dedication that benefit relationships and organizational culture (18, 19).

However, there is no effective instrument for measuring doctors' pleasure at work. Development of work fun scale is limited to enterprise management. Ford et al. developed an instrument covering ten kinds of activities in 2003 (19). Karl and Peluchette established a scale including 40 items (20). Through focus group discussion, expert consultation, exploratory and confirmatory factor analysis, McDowell constructed the scale from four dimensions: socializing with coworkers, celebration at work, personal freedoms and global fun, with six items in each dimension (21). Chan et al. summarized a useable typology "4S" model of work fun in the hospitality industry, but only ten practitioners participated in the survey (22). From the perspective of brand building, Liang Yuqing proposed that work fun includes customer interaction, coworker relationships and enjoy oneself. The Cronbach α coefficient of scale was 0.976 and construct reliability (CR) was 0.993 (23). Wang et al. revised the Chinese Workplace Fun Scale. Data analysis showed that the scale has good reliability and validity. They also said that different types of workplace fun have different effects on employees' performance. But this argument still requires more research to verify in the future (24). To sum up, most of scales of work pleasure are applicable to enterprise management, and many of them only stay in theoretical construction stage, lacking empirical test. Different from corporate employees, doctors have strict work regulations. What is more, the existing scale lacks a reflection of the pleasure of work itself. Some of the latest pleasures are not included. So far, work evaluations of clinicians still use old tools such as working pressure scale, job burnout scale, turnover intention, organizational atmosphere, etc. Happiness is a positive
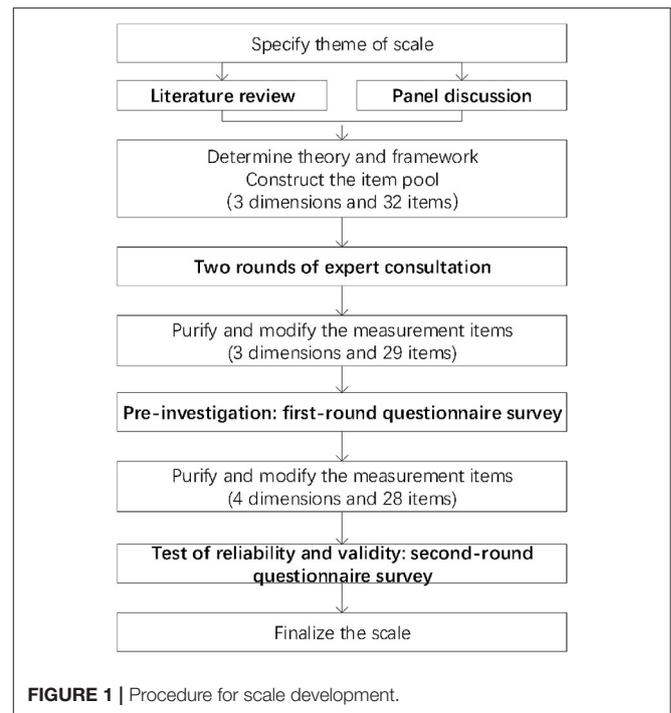
FIGURE 1 | Procedure for scale development.

experience in work, and it is also the life goal that people pursue. To enrich the work evaluation of doctors, this paper tries to develop a scale to measure the joy in work of doctors and test its reliability and validity using mixed methods. It is hoped that this study can better understand the working conditions of doctors and provide reference for doctors and medical institutions to take corresponding measures to improve happiness.

METHODS

Study Design

The scale was developed in four phases. First, we determined the basic theory and constructed the item pool through extensive literature search and panel discussion. Second, the generated items were reviewed by two rounds of expert consultation. Third, we conducted the pilot survey and modified items and dimensions. Forth, we carried out a formal questionnaire survey and assessed reliability and validity of the scale (see **Figure 1**).

Phase 1: Building the Entry Pool and Determining the Scale Structure

On Google academic, Web of science, Elsevier, CNKI and other websites, we took "fun at work" "fun in work" "joy in work" "workplace fun" and "doctor" "physician" "medical staff" as key words to collect the related resource. Many scales were referenced to build the entry pool, such as Liang's work pleasure scale, Minnesota Satisfaction Questionnaire, Job satisfaction scale, McDowell's work pleasure scale, Niehoff and Moorman's fairness scale, Wang Yaming scale, Tews workplace pleasure scale, etc. (19–24). After comparing many theories, we decided to build the scale framework based on self-determination theory.

According to the theory, individual happiness and active behavior are caused by the satisfaction of three psychological needs: the need for competence, the need for autonomy and the need for relationship. All items were expressed in a positive way. That is, if the actual situation is consistent with the item description, the doctor's work fun will be high. Back translation was used to ensure the validity of all English sentences. Through three rounds of panel discussion, the uncertain index items were defined and analyzed. Finally, three dimensions and 32 items were determined.

Phase 2: Identifying the Items by Expert Consultation

The expert consultation form was developed based on the preliminary item pool. The form included experts' information, judgment basis and the importance of each item. The initial scale was sent to experts by email or in person and they were asked to give feedback within the agreed time. A total of 20 experts were invited. After each round of consultation, items were edited according to the critical value of mean, coefficient of variation and full score ratio. After two rounds of consultation, experts' opinions tend to be consistent, indicating that dimension and item selection and cross-cultural Chinese language adaptation have been completed (25). In accordance with the findings from expert consultation, we deleted three items and revised the descriptions of seven items. The dimension of autonomy needs, competency needs and relationship needs contains six items, 15 items and eight items, respectively, with a total of 29 measurement items. The characteristics of experts and details of consultation can be seen in our another article.

Phase 3: Conducting the Pre-investigation

The 29 generated items were piloted among 226 doctors by random sampling and snowball sampling. **Appendix 1** gave the characteristics of doctors. To ensure the representativeness, sensitivity, importance and independence of items, frequency distribution analysis, critical ratio method, variation coefficient (VC) and Cronbach α Coefficient, correlation analysis and exploratory factor analysis (EFA) were adopted to filter and correct items (26, 27). **Appendix 2** provided a detailed operation process. Considering the above six methods, if an item was excluded by two or more methods, the item would be revised or deleted from the scale. The result (KMO = 0.944, Bartlett's test value = 4898.860, $P < 0.001$) indicated perfect appropriateness to conduct exploratory factor analysis. According to the results of factor analysis, the dimension of competency needs was divided into competency perceived needs and competency identified needs. The former meant that something itself can bring pleasure to the individual. The latter referred to something that brings pleasure to the individual from an external environment or related connection. According to the calculation results, we deleted one item and modified 1 item in this phase. The adjusted scale had four dimensions and 28 items.

Phase 4: Testing the Reliability and Validity of Scale
Participants

The formal survey was conducted in March and April 2021. Our participants were doctors working in medical institutions. The formal survey scale consisted of two parts. The scale instructions indicated that our scale was anonymous, participants were voluntary, and our survey aimed to develop a scale to measure their happiness at work. The first part included 28 items that respondents scored one by one. Each item was designed with 5-level Likert scale, and the options were "extremely disagree," "disagree," "general," "agree," and "extremely agree." The second part was designed to collect respondents' individual characteristics.

Considering the sample size recommended for factor analysis, we decided that the number of physicians surveyed should be 10 times the number of projects (27). At first, we chose a local hospital for investigation, which is a tertiary comprehensive public hospital in Hubei province, as well as a university hospital. Seventy questionnaires were distributed with assistance from leaders and the department of medical service. The doctors gave positive cooperation and all questionnaires were recovered. Due to the COVID-19, we also adopted the form of online survey using the survey website wenjuanxing (www.wjx.cn) to collect the view of doctors in other areas. Respondents could scan the access code or click on the website using their computers or phones to access and complete the electronic questionnaire. We sent the access code and website to the human resource managers in hospitals, who then sent the access code to the doctors' online communication groups in their hospitals and WeChat circles of friends. To prevent data duplication, each IP address was allowed to fill in questionnaire only once. We connected nine leaders of hospitals situated in different provinces and 356 doctors voluntarily participated in this survey. Finally, a total of 426 questionnaires were obtained, which met the requirements of sample size.

Ethics approval was obtained from the Ethics Committee of Tongji Medical College, Huazhong University of Science and Technology. All the data were kept confidential and anonymous. Doctors who participated in the offline survey can get a vial of hand sanitizer. Doctors who submitted the online questionnaire will enter a lucky draw and receive an average of 1.5 yuan in red envelopes. Only fully completed questionnaires were valid for this study.

Statistical Analysis

The EpiData entry 3.1 software (the EpiData Association, Odense, Denmark) was used to establish and manage the database. To ensure the accuracy of data, double-entry pattern was adopted. The score of scale was the sum of scores of each item. Statistical analysis was performed using IBM SPSS statistics 22.0 software (IBM, Armonk, NY) and IBM SPSS Amos 17.0 software (IBM, Armonk, NY).

The reliability and validity of 28 items were tested. Reliability referred to the consistency and stability of test results and was examined by Cronbach α Coefficient and split-half reliability

coefficient. Validity referred that the instrument can measure the degree of object, including content validity and construct validity. The former was verified with content validity index (CVI). The latter was tested by correlation analysis and confirmatory factor analysis.

Reliability

When calculating split-half reliability coefficient, we divided the items into an odd group and even groups according to the serial number. Then the correlation coefficient between the two groups was calculated, and the Spearman-Brown formula was applied to estimate the reliability of the whole scale. It is agreed that the split-half reliability coefficient should be >0.7 to reach a reasonable level. The Cronbach α coefficients of the whole scale and each dimension were calculated to evaluate the internal consistency of the scale. The value ranges from 0 to 1. The larger the value, the better the consistency. Generally, values above 0.7 were considered acceptable results (28).

Content Validity

Content validity of the scale was measured by CVI method and item relevance scoring method based on expert consultation. Experts were invited to rate items on a scale of 1–4 (1 being irrelevant, 2 being relevant, 3 being fairly relevant, and 4 being highly relevant) on their relevance to the dimensions they belong to. Project-level CVI (I-CVI) was the number of experts giving a 3 or 4 point evaluation for each project divided by the number of experts and is generally expected to exceed 0.78. Considering the randomness of experts' scoring, we used formula $P_C = \left[\frac{n!}{A!(n-A)!}\right] \times 0.5^n$ to obtain the corrected I-CVI. If the corrected I-CVI were >0.6, it could be admitted as an acceptable level. If the corrected I-CVI were >0.74, it could be considered as an excellent degree. For scale-level CVI (S-CVI), the scale-level content validity/universal agreement (S-CVI/UA) should be >0.8, and the scale-level content validity index/average (S-CVI/AVE) should be >0.9 to reach an ideal level.

Construct Validity

Correlation analysis and confirmatory factor analysis (CFA) were used to test the validity of the structure. Correlation analysis includes three parts: item-total score correlation coefficient, dimensional-total score correlation coefficient and dimensional-dimension correlation coefficient. The reasonable range was (0.3, 0.8), (0.3, 1), (0, 0.8), respectively (29). Only when all coefficients meet the conditions can it be proved that the scale has good relevance and discrimination. Bartlett test of sphericity scores <0.05 and a KMO score of sampling degree >0.70 and close to 1 were considered appropriate for factor analysis (30). As for CFA, model fit indications such as χ^2/df, root mean square error of approximation (RMSEA), comparative fit index (CFI), goodness-of-fit index (GFI), Tucker-Lewis index (TLI), and root mean square residual (RMR) were used to evaluate the model fit. In general, if $\chi^2/df < 3$, RMSEA < 0.08, CFI > 0.90, GFI > 0.90, TLI > 0.90, and RMR < 0.09, indicating that the goodness-of-fit index is reasonable and acceptable (31).

TABLE 1 | Demographic characteristics of respondents.

Variables	Category	N (%)	Variables	Category	N (%)
Age (years)	≤24	37 (8.69)	Working years	1–5	227 (53.28)
	25–34	185 (43.43)		6–10	100 (23.47)
	35–44	109 (25.59)		11–15	45 (10.56)
	45–54	59 (13.85)		≥16	54 (12.68)
	≥55	36 (8.45)	Department	Internal	116 (27.23)
Gender	Male	154 (36.15)		Surgery	96 (22.54)
	Female	272 (63.85)		Obstetrics	46 (10.80)
Title*	Resident	236 (55.40)		Gynecology	31 (7.28)
	Attending	134 (31.45)		Others	137 (32.16)
	Deputy chief	48 (11.27)	Hospital level	Primary	39 (9.15)
	chief	8 (1.88)		Secondary	161 (37.80)
Educational degree	Diploma or below	20 (4.69)		Tertiary	226 (53.05)
	Bachelor's	287 (67.37)			
	Master's	96 (22.54)			
	PhD	23 (5.4)			

*Different from other countries, the rank of titles of doctors in China has four types: resident doctor, attending doctor, deputy chief doctor, and chief doctor.

RESULTS

Respondent Characteristics

Four hundred and twenty six questionnaires were received (70 offline and 356 online) and all were valid, with an effective recovery rate of 100%. The number of doctors from Hubei, Guangxi, Shanxi, Guangdong, Beijing were 70, 56, 56, 42, 40, respectively, accounting for most of the respondents. Other areas were Shandong, Jiangxi, Shanghai, Hebei, Jiangsu. Among them, 154 (36.15%) were male and 272 (63.85%) were female. Most of them were under 45 years old (392, 92.02%). The number of resident and attending doctors were 236 (55.40%) and 134 (31.45%), accounting the most of sample. In terms of educational background, the respondents were mainly undergraduates (287, 67.37%) and masters (96, 22.54%). The number of doctors from tertiary hospital, secondary hospital and primary hospital were 226 (53.05%), 161 (37.80%), and 39 (9.15%), respectively. Respondents characteristics are shown in **Table 1**.

Reliability
Split-Half Reliability Coefficient

The 28 items were divided into odd group (A1, A3, A5, A7, B2, B4, B6, C1, C3, C5, C7, D2, D4, D6) and even group (A2, A4, A6, B1, B3, B5, B7, C2, C4, C6, D1, D3, D5, D7). Statistical analysis showed that the correlation coefficient between two groups was 0.949 and the split half reliability coefficient was 0.974, which met the standard above 0.7, indicating that the scale has a good internal reliability.

Cronbach α Coefficient

After calculation, the overall Cronbach α coefficient value was 0.954, which meet the standard requirements (>0.7), indicating that the structure of scale was reasonable. The value of

Cronbach α coefficient of four dimensions (independent needs, competency identification needs, competency perception needs and relationship needs) were 0.872, 0.864, 0.892, and 0.912, respectively, which were >0.70, indicating that the scale has good internal consistency.

Content Validity

The experts we invited were the same as the experts in second round consultation. As can be seen from the corrected I-CVI in **Table 2**, all items has reached a good level except for B6 and C3. But they were all >0.6, which was considered acceptable. For S-CVI, the S-CVI/UA was 0.571 and the S-CVI/Ave was 0.92 (>0.9). Although S-CVI /UA was lower than 0.8, research showed that the value of S-CVI/UA would decrease as the number of specialists increased. Therefore, the true overall content validity of the scale may be between S-CVI/UA and S-CVI/Ave, which can be considered an acceptable level.

Construct Validity

Correlation Analysis

As shown in **Table 3**, A, B, C, D and T were significantly correlated at α = 0.01 level, and the Spearman correlation coefficient ranged from 0.617 to 0.886, showing a positive correlation. The correlation coefficients between dimensions were 0.617–0.785, all <0.8. The correlation coefficients of dimension-total scores were >0.8, reaching an optimal level. The correlation analysis between items and total scores were shown in **Table 4**. The Spearman correlations of item-total score ranged from 0.556 to 0.749, indicating a good-item total score correlation.

Confirmatory Factor Analysis

The results (KMO = 0.955, Bartlett's test value = 7368.996, $P <$ 0.001) indicated appropriateness to conduct confirmatory factor analysis. For CFA, the model fit indices were χ^2/df = 1.450 (<3.000), RMSEA = 0.033 (<0.08), GFI = 0.920 (>0.90), CFI = 0.908 (>0.90), TLI = 0.907 (>0.90), and RMR = 0.052 (<0.09). From these indicators, it can be seen that the construct validity of the scale has reached an acceptable level.

DISCUSSION

It is necessary to solve the doctor's job burnout and bad emotions from the perspective of positive psychology. However, there is still a lack of available public standards to evaluate the doctors' work joy. Based on the theory of self-determination, this study attempts to develop an instrument to evaluate the doctors' work pleasure by qualitative and quantitative methods. According to the test results, this scale has performed well in the acceptability, validity and reliability among Chinese doctors. The formal scale consists of 28 items, covering four factors: work autonomy needs, competency identification needs, competency perception needs and work relationship needs.

The first dimension, work autonomy needs, refers to the ability of individuals to decide their own behavior based on their real will when faced with choices. When this need is met, doctors

TABLE 2 | Corrected I-CVI of items.

Dimensions/Items	I-CVI	Corrected I-CVI
A. Work autonomy needs		
A1. I have some autonomy in my work schedule	1	1
A2. I think my workload is appropriate	1	1
A3. I have the flexibility to decide how and how to accomplish tasks	0.93	0.92
A4. I can make work decisions based on my own judgment	1	1
A5. I can reasonably express emotions or opinions in the workplace	1	1
A6. I can have a proper rest during my work	0.83	0.82
A7. I am very focused in my work and I don't get interrupted	1	1
B. Competency identification needs		
B1. I think my work is of great significance	1	1
B2. I think my work is creative	0.80	0.79
B3. I think my job is stable	0.80	0.76
B4. I have learned and improved in my work	1	1
B5. I meet new things and have different experiences in my work	1	1
B6. My abilities are recognized by my colleagues and it's a pleasure to work with them	0.75	0.72
B7. My colleagues and I help each other to complete tasks and feel a sense of belonging	1	1
C. Competency perception needs		
C1. I think my work itself is respected	0.8	0.79
C2. I can give full play to my ability in work, meet the needs of patients, and feel happy/satisfied	0.8	0.79
C3. I can communicate happily with patients (relatives) at work, which is helpful for disease treatment	0.67	0.64
C4. I have made outstanding achievements in my work and feel a sense of achievement	1	1
C5. I have completed challenging tasks and experienced the joy of overcoming difficulties	1	1
C6. I feel comfortable with the space where I can give full play to my expertise in my work	0.93	0.92
C7. I have the opportunity to play an important role in the team and achieve excellence	1	1
D. Work relationship needs		
D1. I am satisfied with the commendation activities of the hospital (such as commendation of excellent employees, award of outstanding achievements, etc.)	0.87	0.86
D2. I am satisfied with the welfare provided by the hospital after work (such as issuing daily necessities, food, shopping cards, holding lucky draw, product auction, new year's party, etc.)	0.93	0.92
D3. I am satisfied with the activities organized by the Department for employees' personal or family (such as personal birthday, entry anniversary, visiting family members on holidays or mailing gifts, etc.)	1	1
D4. My superiors treat people equally	1	1
D5. My superior is trustworthy and gives guidance to my work. We have a harmonious relationship	1	1
D6. My organization is fair, and my job can be fairly rewarded	0.93	0.92
D7. Equal opportunities for promotion. I am satisfied with the promotion mechanism of the hospital	1	1

will experience the flexibility and freedom of work, and then get a sense of happiness (32). According to the literature and data analysis, this factor was measured from seven aspects: work time, workload, methods, decision-making, work-life balance, emotion and attention. After expert consultation, it is quite reasonable to exclude the item "I can do what I like to do at work," because it does not reach full score ratio. Unlike company employees, doctors' work is serious and institutionalized since human lives are at stake. Different scales are suitable for people of different occupations. Our research also confirms this point. Some people think that "the pace of modern life is too fast, and it needs to sacrifice rest time to complete the work." In fact, this view is very one-sided and can easily lead to fatigue and depression. Empirical studies show that enhancing employees' autonomy can not only contribute to improve their positive attitude and performance (33), but also increase employees' life satisfaction (34), thus affecting more efficient organizations in turn (35).

According to the results of exploratory factor analysis, competency needs were divided into competency perception needs and identification needs. The item "B1 I think my work is of great significance" indicated that perceiving the meaning of work would bring a happy experience. The work

feature model holds that work meaning is an important work feature, which is determined by skill diversity, task integrity and task importance (36). Sikson Mihai, the founder of flow theory, believed that successful people would deeply feel the significance of their work (37). A survey of doctors in Shandong Province showed that the average index of doctors' work significance was 13.24 ± 0.32, which was positively correlated with doctors' income. The lack of work meaning often leads to negative emotional experience (38). In our study, experts agreed that stability was an important indicator of doctors' emotions. Since the new medical reform, doctors' job stability has improved and their intention to leave has weakened (39). However, according to a survey conducted by the Chinese Medical Association in 2017, 64.48% of medical staff did not want their children to go to medical-related profession (40). How to improve the organizational commitment of clinicians is a problem worth studying in the future. In the dimension perceived needs, item C1 stresses that doctors' work is of great social significance and should be respected by the whole society. However, the current situation is not ideal. Even during the epidemic COVID-19, there are still many violent medical injuries. Related studies have identified that violent medical incidents seriously affect job satisfaction and subjective well-being. As caregivers of patients, some doctors complain that their bad emotions are caused by patients, which is not the case. In fact, this kind of cognition is wrong. They would better learn how to find happiness in their interactions with patients (41). Modern medicine advocates patients to actively participate in medical decision-making. Effective communication with patients at work undoubtedly improves doctors' job satisfaction. Items C4C5C6C7 indicates the uncertainty of medical risks and the challenging tasks of the doctors. Advanced hardware facilities are important, but excellent medical technology is the most valuable wealth that brings doctors a sense of professional accomplishment (42).

TABLE 3 | Spearman correlations of inter-dimension and dimension-total score.

Dimensions	A	B	C	D	T
A	1				
B	0.617**	1			
C	0.625**	0.785**	1		
D	0.705**	0.668**	0.655**	1	
T	0.858**	0.865**	0.867**	0.886**	1

**The correlation is remarkable at α = 0.01 (double end).*

TABLE 4 | Spearman correlations of items and corresponding dimensions or total score.

Items	Correlation between items and corresponding dimensions	Correlation between items and total scores	Items	Correlation between items and corresponding dimensions	Correlation between items and total scores
A1	0.798**	0.663**	C1	0.727**	0.654**
A2	0.767**	0.648**	C2	0.794**	0.679**
A3	0.777**	0.609**	C3	0.777**	0.638**
A4	0.729**	0.619**	C4	0.815**	0.660**
A5	0.772**	0.662**	C5	0.778**	0.624**
A6	0.748**	0.648**	C6	0.816**	0.749**
A7	0.678**	0.677**	C7	0.757**	0.726**
B1	0.773**	0.612**	D1	0.822**	0.743**
B2	0.782**	0.689**	D2	0.816**	0.681**
B3	0.635**	0.556**	D3	0.820**	0.684**
B4	0.804**	0.697**	D4	0.800**	0.689**
B5	0.767**	0.702**	D5	0.794**	0.711**
B6	0.664**	0.584**	D6	0.809**	0.774**
B7	0.775**	0.654**	D7	0.811**	0.748**

**The correlation is remarkable at α = 0.01 (double end).*

Previous research have confirmed that relationship needs are very important for happiness at work. In our research, relationship needs is also an important dimension. It has the characteristics of reciprocity, involving not only the connection and association at the individual level, but also the sense of tolerance and harmony at the group level. In the preliminary investigation, we deleted an item based on the Variation Coefficient as well as Cronbach α Coefficient. The relationship dimension is measured from hospital, department, superior and colleagues. The item D1 focuses on the evaluation of commendation and excellence evaluation activities. The items D2 and D3 focus on the evaluation of entertainment activities. Creating a good working atmosphere through celebrations can significantly improve employees' organizational self-esteem, enhance their relationship energy, and thus effectively enhance employees' sense of belonging and meet their relationship needs (28). Most doctors in China are unwilling to communicate with their superiors and dare not express their thoughts on work easily. They often obey unconditionally before authority, which is mainly related to traditional ideas. However, it is such kind of forbearing and introverted character that will easily leads to excessive work pressure and psychological problems. Some researches proposed that by showing altruistic care and help, leaders could not only protect employees from adverse emotions, but also promote their work enthusiasm and initiative behaviors (43).

During the formal investigation, we collected 426 questionnaires (70 online and 369 offline), all of which were valid, and the effective recovery rate was 100%. It was indicated that the scale was highly recognized. Four factors were extracted from factor analysis, which explained 61.697% of the variance. The Cronbach α coefficient and half-reliability coefficient of the whole scale were 0.954 (>0.7) and 0.974 (>0.7), respectively, which indicated that the scale had good reliability. Additionally, after correction, the I-CVI was higher than 0.60, and the S-CVI/AVE was more than 0.9, which showed that it had good content validity. In terms of construct validity, the correlation coefficient between items and total scores was >0.4, indicating that construct validity was good. In addition, as shown by χ^2/df, RMSEA, RMR, GFI, CFI, and TLI, CFA of the maximum likelihood method supports a good fit with the model.

According to the self-determination theory, if the organizational environment can meet the basic psychological needs of individuals, the internal potential of employees will be activated (44). Positive emotions are directly related to a series of performance behaviors (45). A large amount of evidences show that management practice of focusing on cultivating happy employees can reduce medical errors and improve patient experience. Sharing your happiness with others, and yours will be doubled (46). Zhang Yanling, president of the Chinese Medical Association, pointed out that if one wanted to become a good doctor, he/she should love the profession of doctors, patients, and professional fields, which was the source of happy work (47).

At present, the measurement and evaluation of work pleasure mainly concentrates on the field of enterprises. To our best

knowledge, this study was the first to develop a scale to measure the joy in work of doctors in the world based on self-determination theory. The research method includes expert consultation, group discussion and various statistical methods. The research method is scientific, and the scale has high reliability and validity. The scale can be used in practice to evaluate the doctor's happy working degree; It can also be used as a guide for doctors and medical institutions to take corresponding measures to improve the happiness index. However, this study also has some limitations that need attention.

To ensure the representativeness of the samples, we collected opinions of doctors from 10 provinces. Due to the limitations of COVID-19 epidemic, we mainly adopted the form of online questionnaires and the simple size may be small. Most of the groups using the Internet were young and middle-aged doctors, and there might be bias in sampling. It might lead to some problems in generalizability, especially for old doctors. Further research on a wider population is required. Secondly, the classical measurement theory was used to screen the questionnaire items, and the parameters were estimated through sample analysis. There might be errors in the combination, omission and modification of scale items. Thirdly, we cannot deny the limitations of self-reported data as this might limit the validity of the scale. For various reasons, respondents may underestimate or overestimate the experience of their work. It is necessary to research and develop more measuring tools about job pleasure in the future.

CONCLUSIONS

Based on the self-determination theory, this study develops a scale to measure the joy in work of doctors. The scale has four dimensions, each with seven items, and has good reliability and validity. It is an effective tool to study the doctors' work pleasure. It also helps us to find out the factors that affect doctors' happy work, take targeted improvement measures and create an atmosphere of respecting doctors.

DATA AVAILABILITY STATEMENT

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request. Requests to access these datasets should be directed to hyh288@hotmail.com.

ETHICS STATEMENT

Ethics approval was obtained from the Ethics Committee of Tongji Medical College, Huazhong University of Science and Technology (No. IORG0003571). All the survey were kept confidential and anonymous.

AUTHOR CONTRIBUTIONS

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APPENDIX

APPENDIX 1 | Demographic characteristics of respondents in pilot survey ($N = 226$).

Variables	Category	N (%)	Variables	Category	N (%)
Age (years)	≤24	26 (11.50)	Working years	1–5	111 (49.12)
	25–34	100 (44.25)		6–10	51 (22.57)
	35–44	55 (24.34)		11–15	30 (13.27)
	45–54	19 (8.41)		≥16	34 (15.04)
	≥55	26 (11.50)	Department	Internal	65 (28.76)
Gender	Male	79 (34.96)		Surgery	49 (21.68)
	Female	147 (65.04)		Obstetrics	29 (12.83)
Educational degree	Diploma or below	20 (8.85)		Gynecology	16 (7.08)
	Bachelor's	141 (62.39)		Others	67 (29.65)
	Master's	59 (26.11)	Hospital level	Primary	16 (7.08)
	PhD	9 (3.98)		Secondary	76 (33.63)
Title	Resident	114 (50.44)		Tertiary	134 (59.29)
	Attending	75 (33.19)			
	Deputy chief	32 (14.16)			
	Chief	5 (2.21)			

APPENDIX 2 | Process of editing items in pilot survey.

Method	Operation/ judgment standard
(1) Frequency distribution analysis	If the choice rate of one item was >85% or <15%, it may have a ceiling or floor effect and should be deleted. Otherwise, it should be retained.
(2) Critical ratio method	We took out the front and rear 27% of the scale and divided them into 2 groups. Then t-test was used to identify the difference of each item for the 2 groups. If the P-value was >0.05, the item could not identify different subjects and should be deleted. Otherwise, it should be retained.
(3) Variation coefficient method	The reference standard value was 0.15. If it was ≥0.15, it should be retained. Otherwise, it should be modified or deleted.
(4) Cronbach α Coefficient method	First, the Cronbach α Coefficient of the whole scale was calculated. Then an item was deleted. The Cronbach α Coefficient of the residual scale with left items was calculated again. If the Cronbachα Coefficient of the residual scale was higher than the whole scale, the item should be deleted. Otherwise, it should be retained.
(5) Correlation analysis	If the correlation coefficient of an item to its dimension exceeded 0.6, it was representative and should be retained. If the correlation coefficient of an item to other dimensions was <0.5, it had strong independence and should be retained. Otherwise, it should be deleted.
(6) Exploratory factor analysis	The result (KMO = 0.944, Bartlett significance = $P < 0.000$) indicated perfect appropriateness to conduct exploratory factor analysis. If the factor loading of the item was <0.4, the item should be deleted. Otherwise, it should be retained.

The Effect of Work Connectivity Behavior After-Hours on Employee Psychological Distress: The Role of Leader Workaholism and Work-to-Family Conflict

Mingchao Dong [1†], Tianlu Zhang [1†], Yingwu Li [1,2] and Zhengzheng Ren [1]*

[1] *Department of Psychology, Renmin University of China, Beijing, China,* [2] *The Laboratory of Department of Psychology, Renmin University of China, Beijing, China*

Background: The work connectivity behavior after-hours (WCBA) has become increasingly intense among Chinese employees in recent years, especially in the rapidly developed internet industry. This has made the after-hours work connectivity behavior, a popular topic in the organizational psychology field. Based on boundary theory, we explored the mechanism of after-hour work connectivity behavior on employees' psychological distress and identified the work-to-family conflict (WFC) as mediator. Besides, leader characteristics are essential environmental variables and always play as moderators, among which leader workaholism is prevalent in the internet industry. However, the impact of leader workaholism on employees' behavior is still inconsistent and even contradictory. Thus, this study further examines the moderating effect of leader workaholism between the after-hour work connectivity behavior and employees' psychological distress.

Methods: We conducted a multitime, multisource questionnaire survey in Internet companies in China. Before collecting the data, all participants were assured that their responses would be confidential and used only for academic research. At time 1, the team leader rated his or her workaholism, and team members rated WCBA. At time 2 (3 weeks later), team members were asked to complete the questionnaire containing scales of WFC, psychological distress. The two rounds of data collection resulted in 211 matched team leader–team member responses. We performed a path analysis using Mplus 7.4.

Results: Both the duration and frequency of WCBA can positively predict employees' psychological distress through WFC (the mediating effect = 0.628, 95% CI = [0.593, 0.663]). Specifically, WCBA can increase the level of WFC, which leads to the employees' psychological distress further. Leader workaholism can negatively moderate the relationship between WCBA and WFC, further moderating the mediating effect of WFC.

Conclusions: Work-to-family conflict played as a mediator in the relationship between WCBA and employees' psychological distress. These results may be helpful to recognize the negative effect of WCBA and the role of leader workaholism in the relationship.

Keywords: work connectivity behavior after-hours, work-to-family conflict, leader workaholism, psychological distress, mental health

INTRODUCTION

The development of information technology has intensified the competition in the capital market and made the Internet field a high-pressure industry, which has created more overtime work and more flexible working systems. Some organizations hope that their employees can keep online for their job during off-work hours so that they could be prepared to work at any time. This typical work connectivity behavior after-hours (WCBA) often leads to individuals' physical fatigue and psychological distress. It is also an invasion of family time, which leads to the breakdown of work–family balance. Drawing on the work–family boundary theory, work-to-family conflict (WFC) can cause employees' psychological distress. However, there is seldom literature exploring the relationship between WCBA and employees' psychological distress from the work–family boundary perspective. This study aims to address this gap by introducing WFC as a mediator based on work–family boundary theory. Besides, leader characteristics are important environmental variables. In the Chinese internet industry, leader workaholism is prevalent. How this environmental variable works on WFC and employees' psychological distress are also one question of this study.

THEORETICAL BACKGROUND AND HYPOTHESIS

WCBA and Psychological Distress of Employees

In this study, WCBA refers to employees participating in work in any place outside of working hours. According to the boundary theory, the impact of work connectivity behavior on individual health during non-working hours can be divided into work and family interfaces. On the work interface, employees will suffer from physical and mental exhaustion, emotional exhaustion, job burnout (1), a decrease in job satisfaction when they experience longtime non-working hours' connections. They would even have the psychological tendency to try to disengage from work (2). Ragsdale and Hoover (3) investigated the relationship between WCBA and employees' emotional exhaustion and found that using Internet communication tools (ICTs) to deal with work during non-working hours increases individual emotional exhaustion and role stress. At the family interface, according to the allostatic load theoretical model (4), dealing with excessive work pressure for a long time will have dual impacts on employees' mental and physical health and eventually increase the occurrence of depression and cardiovascular diseases. Li et al. (5) used the job demand and control (JDC) model to

study the employees of a company in state grid. They found that the increase of working hours per week had a positive prediction on occupational stress and depressive symptoms measured by the PHQ-9 scale. When employees worked more than 60 h per week, their health risks increased significantly, and excessive or frequent connectivity during nonworking time consumes a large number of mental resources and affects self-recovery (6). Overall, being occupied by work in the leisure time would hurt individuals' physical and mental health, which is also known as psychological distress. Thus, we propose the following hypothesis:

Hypothesis 1: WCBA is positively related to employee psychological distress.

Mediating Role of WFC

Through the lens of work–family boundary theory, time-based conflict may occur when the time spent on ICTs outside of work hours makes them no longer able to participate in their family roles and activities because individuals cannot allocate time to work and family time. Besides, the use of work-related ICT outside of working hours may trigger stress spillages from the work area to the home. Continuous connectivity makes it more difficult for people to dissociate and disengage from work at home, thus impeding the recovery of work stress outside of working hours (7), and stress-based conflict can happen.

Studies have shown that frequent WCBA induces ontogenesis of WFC (8). WFC leads to job dissatisfaction, turnover intention, and stress, and WFC plays a mediating role between the flexibility of work schedule and work stress (9). Liang and Chen (10) explored the influencing factors of fatigue among 3,603 employees of 35 Internet enterprises. They found that the use of Internet communication technologies and tools positively predicted the level of work stress. In contrast, occupational stress factors brought by work stress were negatively correlated with employees' mental health. Some scholars have further investigated the differences in WFC on employees of different genders and found that the traditional male and female division of labor still affects the amount of family role sharing. WFC is significant in predicting depression symptoms of female training physicians (11). Moreover, the psychological distress caused by WFC is higher for women than for male individuals (11). Therefore, we propose the following hypothesis:

Hypothesis 2: WFC has a mediating effect on WCBA and employee psychological distress.

Moderating Role of Leader Workaholism

According to the previous studies, workaholism refers to the phenomenon of employees who become overindulging in work so that their health and family life are harmed (12). Based on this

definition, this study defines a workaholic leader as individuals who are physically overworked and cognitively addicted to work. Workaholism tends to stimulate a tense and competitive work environment and develop negative interactions with employees. WCBA tends to cause resentment, anger, and other negative emotions in individuals, thus causing WFC (13). According to Andreassen et al. (14), leaders with high levels of workaholism tend to vent their negative emotions to their employees and therefore raise employees' aggression, which would increase negative emotional expression in the family and trigger WFC. In addition, workaholic leaders tend to give vague or unreasonable task requirements to employees, which consumes employees' time and energy, so employees of workaholic leaders are more likely to work overtime, which ultimately increases the possibility of WFC. A leader with high-level workaholism may strengthen the relationship between WCBA and WFC (15), which thereafter damages mental health. Therefore, we propose the following hypothesis:

Hypothesis 3a: Leader workaholism positively moderates the relationship between WCBA and WFC. When the leader's workaholism tendency is high, the positive prediction of WFC by WCBA is strengthened, whereas weakened.

However, the existing literature has not reached a consensus on whether workaholic leaders play a positive or negative moderating role between WCBA and WFC. Pan (16) found that when employees are encountering WFC, leader workaholism could provide necessary social support. Employees who experience high levels of social support at work (17) are more likely to continue working after working hours because they enjoy the interpersonal support and work assistance from colleagues. Therefore, the support brought by workaholic leaders may weaken the impact of WCBA on WFC. Thus, an auxiliary hypothesis is proposed:

Hypothesis 3b: Leader workaholism negatively moderates the relationship between WCBA and WFC. When the leader's workaholism tendency is high, the positive prediction of WFC by WCBA is weakened, whereas strengthened.

Combining hypotheses 2 and 3, a moderated mediating effect model is proposed:

Hypothesis 4: Leader workaholism moderates the indirect effect between WCBA and employee psychological distress *via* WFC. This indirect effect can be moderated by the leader's workaholic tendencies.

The theoretical model of this study is shown in **Figure 1**.

METHODS

To test the hypothesis, we used the questionnaire method.

Participants

Participants include both team leaders and their direct employees in four internet companies located in Beijing, Guangzhou, Shanghai, and Hangzhou.

Procedure

The data were collected in two waves, from March to April in 2021. First, we contacted several HR managers in four internet companies to ask their support to release the paper questionnaires in their companies. The questionnaire contains demographic information and was attached with a letter explaining the purpose of the survey, voluntary participation, and guaranteed confidentiality. At time 1, the workaholism scale was sent to team leaders in four companies, and one direct team member of the leader rated his/her WCBA. At time 2 (three weeks later), these team members were recontacted to complete the scales of psychological distress and WFC. All scales were clearly explained with unified and standardized instructions given by researchers. A total of 1,200 questionnaires were sent in the first wave, which include 600 leader versions and 600 employees' versions. The second wave contained 600 questionnaires only for employees. All participants were asked to fill out the questionnaire and put it back into an envelope that was collected by our research team.

Measurement

Each variable in the self-administered survey was measured using a multiitem scale, each of which was adopted from relevant prior research. As all our participants were Chinese, we followed the double-blind backtranslation procedure (18) to translate all items into Chinese. To avoid translation ambiguity, each item was translated by professional translators. The internal consistency of each scale was verified through Cronbach's alpha.

Work Connectivity Behavior After-Hours (WCBA)

Work connectivity behavior after-hours was assessed by a 13-item scale of Wu et al. (15) recommended by Richardson and
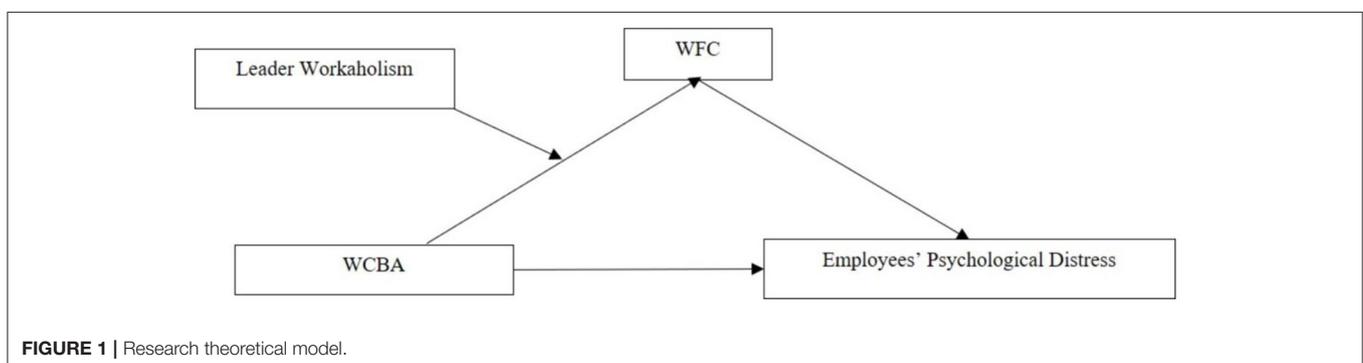
FIGURE 1 | Research theoretical model.

TABLE 1 | Means, standard deviations, and correlations of the research variable.

Variable	1	2	3	4	5	6	7	8	9
Individual level									
1. Gender	1.00								
2. Age	−0.07	1.00							
3. Education	−0.03	−0.11	1.00						
4. Employee's tenure	−0.01	0.65**	−0.06	1.00					
5. Marriage	−0.02	0.15*	−0.03	0.07	1.00				
6. WCBA	0.00	−0.12	−0.13	−0.06	−0.02	1.00			
7. WFC	−0.02	−0.06	−0.12	−0.00	−0.01	0.90**	1.00		
8. Psychological distress	−0.02	−0.13	−0.10	−0.09	0.03	0.87**	0.89**	1.00	
9. leader workaholism	0.07	0.07	−0.16*	0.05	0.09	0.69**	0.75**	0.69**	1.00
M	1.55	27.56	2.010	2.340	1.650	2.821	2.543	2.631	3.54
SD	0.50	3.19	0.4	2.196	0.690	0.907	0.918	0.743	1.16
Leadership level	1	2	3	4	5	6			
1. Gender	1.00								
2. Age	−0.16*	1.00							
3. Leader's education	0.02	−0.10	1.00						
4. Leader's tenure	−0.10	0.46**	−0.08	1.00					
5. Marriage	0.04	0.21**	0.17*	0.07	1.00				
6. leader workaholism	0.02	0.04	−0.11	0.05	−0.02	1.00			
M	1.48	34.14	2.51	4.30	2.82	3.54			
SD	0.50	3.95	0.50	2.16	0.58	1.15			

N = 211. WCBA, work connectivity behavior after-hours; WFC, work-to-family conflict. * p < 0.05. ** p < 0.01.

TABLE 2 | Fit indices of each model.

Model	Factor	χ^2	df	χ^2/df	RMSEA	SRMR	CFI	TLI
Six factors model	A1,A2,B1,B2,C,D	1,094.427	764	1.432	0.045	0.039	0.955	0.952
Five factors model	A1+A2,B1,B2,C,D	1,140.215	772	1.477	0.048	0.039	0.950	0.947
Four factors model	A1+A2,B1+B2,C,D	1,145.751	776	1.476	0.048	0.040	0.950	0.947
Three factors model 1	A1+A2+C, B1+B2,D	1,820.138	776	2.346	0.080	0.083	0.858	0.851
Three factors model 2	A1+A2,B1+B2+D,C	1,207.577	779	1.550	0.051	0.041	0.942	0.939
One factor model	A1+A2+B1+B2+C+D	2,148.505	779	2.758	0.091	0.070	0.814	0.804

N = 211; A = Work connectivity behavior after-hours (A1 and A2 represent two dimensions: duration and frequency); B = work-to-family conflict (B1 and B2 represent two dimensions: conflict over time and conflict overstress); C = leader workaholism; D = psychological distress.

Benbunan-Fich (19) who suggested collecting "lean" measures to capture activity (e.g., duration of use) and also "rich" measures that incorporate information about the nature of the activity (e.g., breadth of use, the context of use). Therefore, we collected self-reported measures of both duration (e.g., how much time they use the wireless devices) and frequency in context (e.g., how often they use the devices during particular non-work activities). Each item was measured on a 5-point Likert scale, ranging from 1, which indicates "never," to 5, indicating "always." First, we measured WCBA duration by asking respondents to report, on average, how much time they used each device (e.g., wireless email devices and laptops) to perform job-related duties during non-work hours. We collected responses for four time periods (e.g., before work, after work, during days off, and weekend and vacation). We provided response categories in ranges of minutes to create a Likert-type scale (e.g., 1–15 min, 16–30 min, et al.).

The Cronbach's alpha was 0.830. Second, to create a measure for WCBA frequency, we followed Boswell and Olson-Buchanan (20), who asked respondents to report the frequency (on a Likert-type scale) with which they used an array of communication technologies to perform their job during non-work hours. Their study responses to the individual technologies were averaged to create an overall index of reported communication technology use after hours. To improve the reliability of Boswell and Olson-Buchanan's measure, we first asked about the use of a specific technological device (e.g., handheld wireless devices, laptops) rather than the communication medium (e.g., sending and receiving work emails, contacting colleagues or customers, logging in to the company website, etc.), and then, we asked how frequently each device is used during a specific non-work activity (e.g., shopping, travel/vacation, dinner, reading, fitness, etc.). We averaged the responses to the individual technologies to create

	WFC				Psychological distress		
	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**	**Model 6**	**Model 7**
Control variables							
Employee's gender	0.089	0.027	0.032	0.04	0.037	−0.023	−0.039
Employee's age	−0.100	0.041	0.004	0.003	−0.141	−0.005	−0.029
Employee's education	−0.128	0.001	0.012	0.016	−0.113	0.011	0.011
Employee's tenure	0.056	0.023	0.028	0.006	−0.009	−0.041	−0.054
Employee's office term	0.003	0.003	−0.015	−0.022	0.043	0.044	0.042
The independent variables							
WCBA		0.901**	0.733**	1.092**		0.871**	0.349**
The moderating variables							
Leader workaholism			0.238**	0.543**			
The interaction effect							
WCBA*leader workaholism				−0.618**			
The intervening variable							
WFC							0.58**
R^2	0.030	0.808	0.835	0.842	0.034	0.761	0.826
ΔR^2	0.030	0.508**	0.805**	0.812**	0.034	0.727**	0.792**
F	1.267	142.889**	147.001**	134.977**	1.425	108.556**	137.767**

$N = 211$. The regression coefficient β is the standardized coefficient. $^{**}p < 0.01$.

an overall index of WCBA frequency. The Cronbach's alpha was 0.914, and the Cronbach's alpha of the total scale was 0.933.

Leader Workaholism

Workaholism was measured with a 10-item scale from the Chinese version of She et al. (21) and the original English scale from Schaufeli et al. (22). Workaholism was operationalized by two scales: WE, as assessed with the 5-item Compulsive Tendencies Scale of the WART (23); WC, as assessed with the 5-item drive scale of the WorkBat (24). Items were scored on a 5-point rating scale, which ranges from 1 (totally disagree) to 5 (totally agree). Sample items were "racing against the clock, continue to work after colleagues left, many irons in the fire, more time working than socializing, doing two or three things at a time, important to work hard." Cronbach's alpha was 0.960.

Work-to-Family Conflict

Work-to-family conflict was assessed using the four-point scale of Carlson et al. (25). Six items were used to measure WFC. Chinese scholar Wu et al. (15) stated that the items included subscale based on time conflict and subscale based on stress conflict. Sample items were "due to various pressures at work, sometimes even when at home, I am not in the mood to do what I like." Cronbach's alpha was 0.936.

Psychological Distress

Psychological distress (PD) was measured by General Health Questionnaire (GHQ-12), which was widely used to measure the psychological distress (26). The scale asks whether the respondent has experienced a particular symptom or behavior recently. Each item is rated on a four-point scale (less than usual,

no more than usual, rather more than usual, or much more than usual), and it gives a total score of 12 or 36 based on the scoring method selected. The most common scoring methods are bimodal (0–0–1–1) and Likert scoring (0–1–2–3). Since the latter produces a more acceptable distribution of scores for parametric analysis (less skewed and less kurtosis), we used the Likert scoring style for this study. A higher score indicates a lower degree of mental health, in other words, a higher degree of psychological distress. Cronbach's alpha was 0.945.

Control Variables

According to previous studies, we also collected the following demographic variables as control variables: age, gender, education level, and tenure (4, 27).

Analytical Approach

The software SPSS 24.0 was used to conduct fundamental analyses, which includes descriptive statistics and correlations for WCBA, WFC, psychological distress, and leader workaholism. All variables were computed, and descriptive statistics, namely mean (*M*) and standard deviation (*SD*), and correlations between variables were obtained. Mplus 7.4 software was used to establish structural equation models (SEMs). In this study, a bootstrapping analysis was conducted with WCBA as the independent variable, Psychological distress as the outcome variable, WFC as mediators, and leader workaholism as moderator, with 5,000 resamples to test a moderated mediation model and to calculate the 95% CIs. The number of subdimensions in each scale was unequal; thus, mean scores of the items were used for all observable variables in this study.

TABLE 4 | The moderating role of leader workaholism.

Variable	WFC		WFC	
	β	t	β	t
WCBA	0.73***	18.62***	0.73***	18.79***
Leader workaholism	0.24***	6.04***	0.16***	3.54***
Product interaction term			−0.12**	−3.02**
R^2	0.83***		0.84**	
F	518.92***		362.52***	

** p < 0.01, *** p < 0.001.

RESULTS

Descriptive Results

After eliminating incomplete and invalid questionnaires, 211 groups of valid matching data were finally collected. That is to say, 422 questionnaires were recovered with an effective response rate of 77%. Participants come from Beijing, Guangzhou, Shanghai, and Hangzhou, where many concentrated Internet enterprises. The sample characteristics of subordinate employees are as follows: average age is 27.56 years ($SD = 3.189$), men account for 44.4%, women account for 55.6%. The average working year is 2.34 years ($SD = 2.196$). College degree or below accounts for 10.7%, a bachelor's degree accounts for 78.6%, and master's degree or above accounts for 10.7%. The sample characteristics of direct leaders are as follows: average age is 34.14 years ($SD = 3.947$), 51.7% men and 48.3% women. The average working year is 4.3 years ($SD = 8.354$). College degree or below accounts for 0%, a bachelor's degree accounts for 49.3%, master's degree or above accounts for 50.7%.

The average scores and the standard deviations of variables under study and their Pearson's correlations are presented in **Table 1**. Tenure was positively correlated with age ($r = 0.65$, $p < 0.01$) but not with WCBA and WFC. WCBA was positively correlated with WFC ($r = 0.90$, $p < 0.01$) and psychological distress of employees ($r = 0.87$, $p < 0.01$). WFC was positively correlated with psychological distress ($r = 0.89$, $p < 0.01$), which provided the basis for hypothesis testing. From the perspective of leadership, the age of leaders was positively correlated with their tenure, whereas leader workaholism was not correlated with the educational background, age, and marital status of leaders, but negatively correlated with the tenure of employees ($r = -0.16$, $p < 0.05$). In addition, leader workaholism was positively correlated with WCBA ($r = 0.69$, $p < 0.01$), WFC ($r = 0.75$, $p < 0.01$) and psychological distress ($r = 0.69$, $p < 0.01$). Multiple regression analysis is needed to confirm further the relationship among the variables between the leader and employees at the crossorganizational level. The mean, standard deviation, and correlation coefficient of each variable are shown in **Table 1**.

Common Method Bias

To test the extent to which the models are affected by common method bias, Harman's one-factor test was adopted. The goodness-of-fit index of one-factor model is as follows (See **Table 2**): $\chi^2 = 2,148.10$, $df = 799$, TLI = 0.804, CFI = 0.814,

SRMR = 0.070. The goodness-of-fit index of six-factor model is as follows: $\chi^2 = 1,094.427$, $df = 764$, RMSEA = 0.045, SRMR = 0.039, CFI = 0.955, TLI = 0.952. The goodness-of-fit index of the six-factor model was far better than that of the one-factor model, which suggested that common method variance had less influence on this research. Besides, the six-factor model was far better than that of the other models as well, which suggested that our model has good discriminant validity.

Stepwise Regression of the Study Variables

Stepwise regression analysis was first conducted to test the hypothesizes, and **Table 3** summarizes the result of the regression. We first entered control variables that include several demographic information. There is no significant impacts of age and gender on overtime work. The second step introduced WCBA and found that WCBA had a significant regression prediction for WFC ($\beta = 0.901$, $p < 0.01$). In the third step, we introduced leader workaholism and found that the leader workaholism could significantly predict WFC ($\beta = 0.238$, $p < 0.01$), and the regression coefficient between WCBA and WFC changed under the leader workaholism ($\beta = 0.733$, $p < 0.01$). The fourth step examined the interaction effect between WCBA and leader workaholism. The results showed that leader workaholism had a significant negative moderating effect on the relationship between WCBA and WFC, and the interaction term was significantly negative ($\beta = -0.618$, $p < 0.01$). Models 2, 3, and 4 combined to prove that leader workaholism played a weakening moderating role between WCBA and WFC, that is, with the increase of leader workaholism, the predicted value of WCBA to WFC decreased, which prove that hypothesis 3a is false and hypothesis 3b is supported. Model 6 showed that WCBA could significantly positively predict the psychological distress of employees ($\beta = 0.871$, $p < 0.01$), and Model 7 showed that WFC also significantly positively predicted the psychological distress of employees ($\beta = 0.580$, $p < 0.01$), which confirms that WFC could play a mediating role in the relationship between leader workaholism and psychological distress of employees. Both Hypotheses 1 and 2 were supported.

Moderating Effect Testing

For the study's accuracy, the moderating effect test was then carried out. In addition, the product of the WCBA index and leader workaholism index was used as the interaction index, and the moderating effect of the product was tested. The results showed that the interaction between WCBA and leader workaholism could significantly predict WFC ($\beta = -0.12$, $p < 0.01$), as shown in **Table 4**. F test showed significant regression equation ($R^2 = 0.84$, $F = 362.52$, $p < 0.001$). A simple slope test was conducted, a moderating effect graph was made, and the results are shown in **Figure 2**. The slope of the interaction term was negative, which proves that leader workaholism had a weakening moderating effect in the relationship between WCBA and WFC. As the tendency of leader workaholism becomes higher, the positive correlation between WCBA and WFC still exists, but it is weaker than before. Hypothesis 3b was supported again.
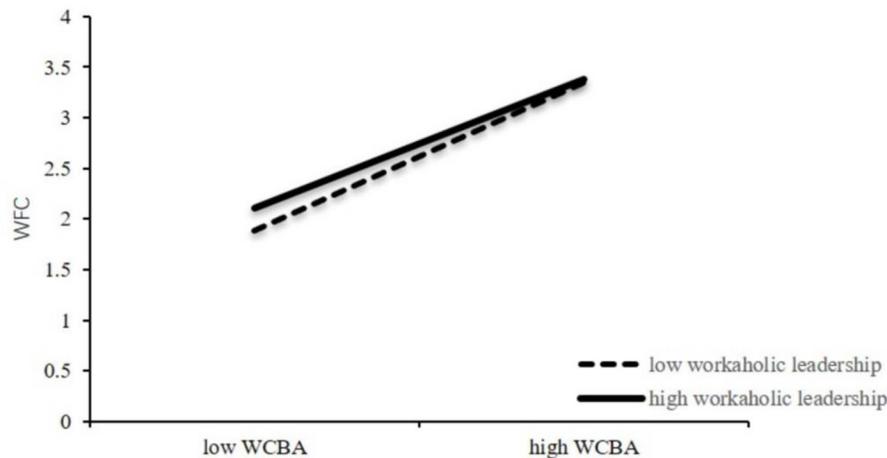
FIGURE 2 | The moderating effects of leader workaholism on WCBA and WFC.

TABLE 5 | The model fitting index of the mediating effect.

Model	χ^2	df	χ^2/df	CFI	TLI	RMSEA	SRMR
A	394.70	272	1.45	0.97	0.96	0.05	0.04
B	630.22	430	1.46	0.96	0.96	0.05	0.04

Mediating Effect Testing

The mediating effect of WFC was tested by SEM using Mplus 7.4 with WCBA as an independent variable, employees' psychological distress as a dependent variable, and WFC as a mediator. Basic model A represents the direct effect of WCBA on employees' psychological distress, and Model B represents the effect of WCBA on employees' psychological distress with WFC as the mediator.

The model fitting index is shown in **Table 5**. The mediating model (model B) fit well (TLI = 0.96, CFI = 0.96, RMSEA = 0.05, SRMR = 0.04). **Table 6** summarized the indirect effect test result. The direct and indirect effects of WCBA on employees' psychological distress were 0.306 ($p < 0.001$) and 0.628 ($p < 0.001$), which account for 32.76% and 67.24%, respectively, in the total effect. The results of the Bootstrap analysis show that the fitting data of the main models in this study are good. The Bootstrap analysis results showed that the 95% confidence interval of the path in Model B was [0.899, 0.976], excluding 0, which indicates a significant partial mediating effect of WFC on the WCBA-psychological distress relationship.

Moderated Mediation Effects Testing

Mplus7.4 was used again to justify the moderated mediation model with Bootstrap. WCBA path diagrams based on duration and frequency are shown in **Figures 3**, **4**.

With arrows that indicate the direction in which the antecedent variable acted on the outcome variable, from the figure, we could see the direct effect and indirect effect among the variables, and the path coefficient represented the strength of the correlation between the variables.

However, only the path diagram was far from enough, and SEM fitting index test was a vital link. Based on generalized least squares estimation (GLS), the following indexes were used as the model fitting indexes: TLI > 0.9, RMSEA < 0.08, CFI > 0.9, SRMR < 0.08, which proves that the moderated mediating effect model in this study has a good fitting degree. Thus, Hypothesis 4 was supported. It was found that WCBA positively predicted WFC. With the increase of leader workaholism, the positive predictive effect of WCBA on WFC was weakened (but the two were still positively correlated), which might be related to the double characteristics of leader workaholism with high job requirements and high job involvement:

First, the high work requirements of workaholic leaders make workaholic leaders highly positively correlated with WCBA and WFC.

Second, the high work commitment of workaholic leaders provides resource support for employees. With the continuation of WCBA, workaholic leaders will provide more work support, such as providing problem-solving ideas and delegating colleagues to share the work, etc., which alleviates subordinate WFC.

Finally, whether from the perspective of high job requirements or high job involvement, the workaholic leader will provide work support and help to the subordinates to ensure the timely completion of the project. The higher the degree of workaholism, the more resource support employees get, which weakens the positive predictive value of WCBA to WFC. The research results are not only consistent with the resource conservation theory but also consistent with the research results of Pan (16).

DISCUSSION

This study reveals that WCBA can positively predict employees' psychological distress, and WFC plays a mediating role in the relationship between WCBA and employees' psychological

Item	Point estimate	Product of coefficients			BC 95% CI	
		S.E.	Est./S.E.	P-Value	Lower	Upper
Total	0.934	0.021	44.162	$p < 0.001$	0.899	0.976
Total direct	0.306	0.021	14.737	$p < 0.001$	0.265	0.306
Total indirect	0.628	0.021	29.555	$p < 0.001$	0.593	0.663

BC 95% CI, bias-corrected 95% bootstrap confidence interval.

FIGURE 3 | Model path diagram based on the duration of WCBA.

FIGURE 4 | Model path diagram based on the frequency of WCBA.
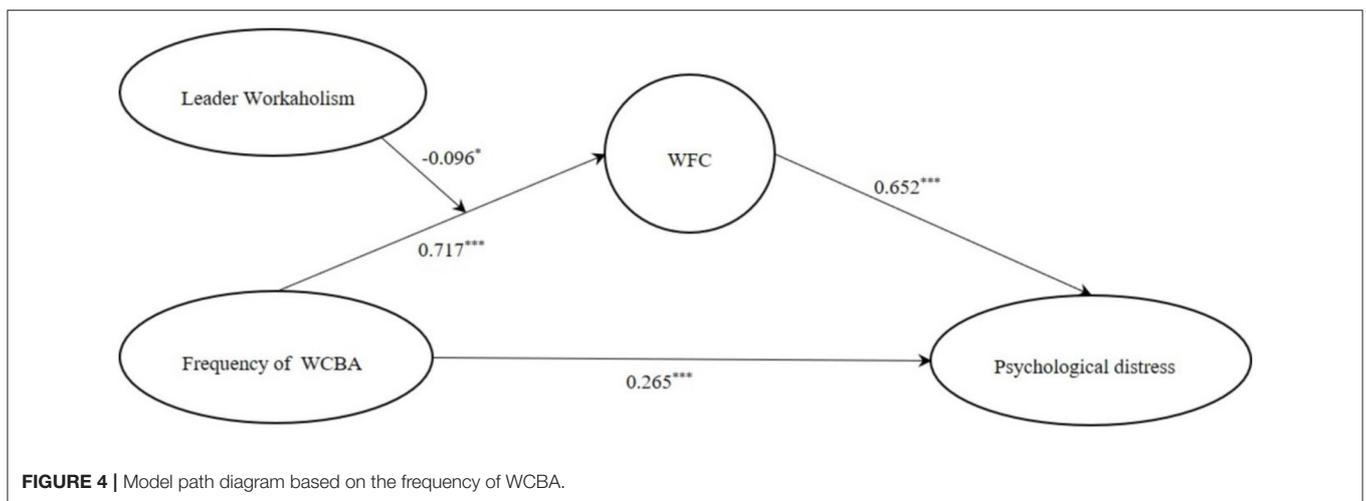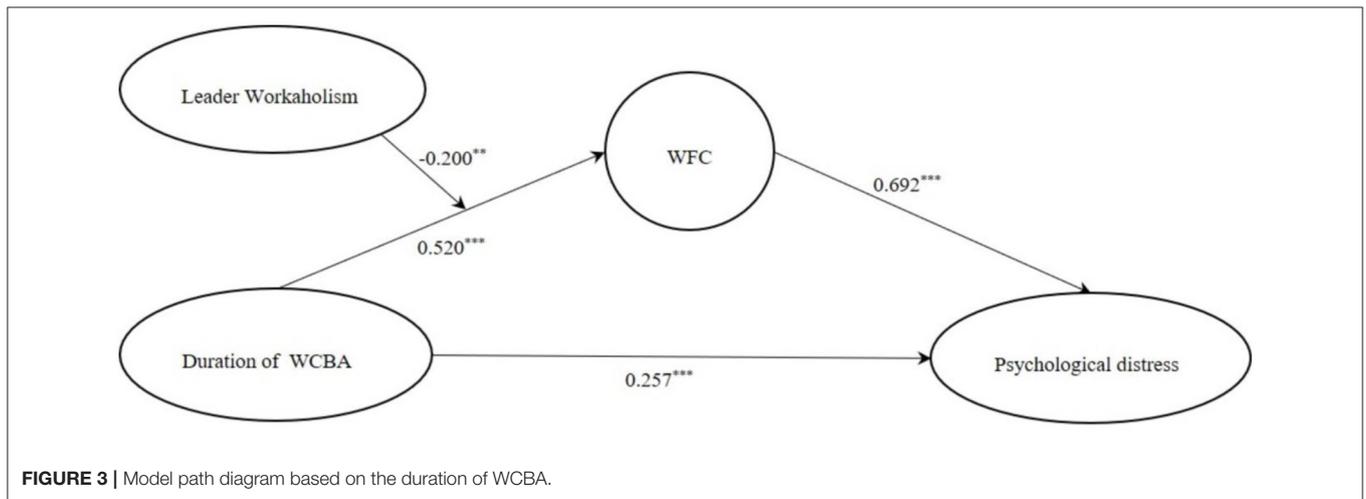
distress. Leader workaholism negatively moderates the relationship between WCBA and WFC. When the leader's workaholism tendency is high, the positive prediction of WFC on WCBA is weakened, and vice versa. Furthermore, leader workaholism moderates the indirect effect of WFC, that is, the indirect effect is stronger when the leader's workaholic tendencies are lower.

Theoretical Implications

First, we again verified that WCBA positively predicts employees' psychological distress, which is consistent with previous studies

(1–3). In addition, past questions about WCBA and psychological distress mechanisms have mainly been approached from the perspective of individual cognitions (28, 29). However, environmental factors, especially family environmental factors, are also essential for employees' mental health (9, 11). Therefore, we filled this gap by verifying the mediating effect of WFC in WCBA and individual psychological distress from the perspective of work–family boundary theory. Our findings expand the scope of work–family boundary theory in explaining organizational context factors and individual psychological distress. In the future, other variables of the work–family boundary can be

further explored in the relationship of WCBA and employees' psychological distress, such as work–family balance. Finally, we explored the boundary conditions of this mechanism. We obtained an interesting finding that the degree of workaholism of the leader is an important moderator. When the degree of workaholism of the leader is high, it can weaken the predictive effect of WCBA on WFC, thus decreasing the negative predictive effect on employees' mental health. A leader's behavior and attitude to work can cause spread step-by-step and transfer to the subordinates. Our study further enriches the empirical research literature on the transmission effect of leadership.

Practical Implications

Our study showed the negative predictive effect of WCBA on employees' mental health. Therefore, at the individual level, individuals should participate in life activities appropriately after work, increase the transition activities between work and non-work fields to promote psychological detachment, and maintain mental health. At the organizational level, managers should make reasonable use of human resource management theory, scientifically design the working process to avoid employees' WCBA, which is conducive to alleviating employees' job burnout (30).

We found that WFC is the mediating mechanism of predicting the effect of WCBA on employees' mental health. Thus, when some work tasks have to be done during family time, the company should give enough support to employees, especially the support to the family, to reduce the impact of work on the family. For example, the enterprise can hold family-orientation activities to give employees much more time to spend with family.

Leader workaholism will bring serious negative predictive effect on employees' physical and mental health, which is not conducive to the organization's long-term development. Interestingly, however, our findings suggested that leader workaholism negatively moderates the relationship between WCBA and WFC. It is the resources to complete the work from workaholic leader that weaken the negative predictive effect of WCBA; thus, leaders need to provide problem-solving resources during employees' non-working hours.

Limitations and Future Research

From the theoretical perspective, it is suggested to consider in the future: First, experimental design, such as laboratory experiments or intervention studies, should be introduced to clarify further the influence of WCBA on individuals and its mechanism of action. Second, we suggest that subsequent researchers combine field studies, quasiexperimental studies, case studies, and in-depth interviews to explore the deeper relationship between WCBA and individual psychological distress or organizational performance. Third, in terms of data collection, on the one hand, longitudinal timing design should be combined; on the other hand, self-evaluation of the subjects should be combined with other objective evaluations, such as using the APP to record the time and frequency of WCBA. Fourth, we suggest considering the forced selection scale measurement to distinguish the workaholic and non-leader workaholism in the statistical analysis method. Last, considering that our results are based on the Chinses

sample, cross country studies are needed to test the stability of our results.

From the empirical perspective, besides the moderating effect of leader workaholism, job characteristics and individual subjective will may also present the pathway function of non-working time connecting to WFC. Considering only leader workaholism as a moderating variable is a little monotonous, which can be improved in the future. What is more, to enrich the transmission path between leaders and subordinates, more variables such as job characteristics (organizational assessment and workload) and leadership style (such as authoritative leadership) can be explored in the future.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservations.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by this study was carried out in accordance with the recommendations of the Ethics Committee of the Department of Psychology, Renmin University of China, with written informed consent from all subjects. All subjects gave written informed consent in accordance with the Declaration of Helsinki. The protocol was approved by the Ethics Committee of the Department of Psychology, Renmin University of China. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

MD designed and drafted the work. TZ made the main revision for the study and replied to reviewers. YL revised the original manuscript and the revisions. ZR collected the data. All authors contributed to the article and approved the submitted version.

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SUPPLEMENTARY MATERIAL

The Supplementary Material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fpubh.2022.722679/full#supplementary-material

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Act Tough and Soft: Video Monitoring, Hongbao Gifts, and the Job Satisfaction of Domestic Workers

Anuo Yang [1†], Shuangle Fu [1†], Linping Liu [2*], Changyu Fan [3] and Maitixirepu Jilili [1]

[1] School of Social and Behavioral Sciences, Nanjing University, Nanjing, China, [2] School of Public Administration, Hangzhou Normal University, Hangzhou, China, [3] School of Sociology, Central China Normal University, Wuhan, China

There is a rapidly growing demand for domestic services among urban families in China. However, domestic work remains a low-status occupation with a high turnover rate. Focusing on the job satisfaction of domestic workers is useful to interpret this phenomenon. We investigate how the job satisfaction of domestic workers in China is affected by to two distinct labor control strategies used by their employers: the installation of video-monitoring devices in employers' homes (a "tough" control strategy), and the Chinese custom of giving monetary gifts, or "hongbao" (a "soft" control strategy). By analyzing data from surveys of domestic workers in four cities in China ($N = 699$), we find that video monitoring in employers' homes negatively impacts domestic workers' job satisfaction, and that hongbao gifts from employers significantly promote domestic workers' job satisfaction. The analysis of the causal mechanism based on a structural equation model suggests that video monitoring can increase the discrimination that domestic workers perceive, which in turn reduces their job satisfaction. In particular, we find that domestic workers' perception of discrimination completely mediates the effect of video monitoring on their job satisfaction. However, we also find that hongbao gifts significantly reduce domestic workers' perceptions of discrimination, and thus promote their job satisfaction; that is, the relationship between hongbao gifts and job satisfaction is partially mediated by discrimination. Our study provides a more comprehensive understanding of Chinese employers' labor control strategies and their effects on the job satisfaction of domestic workers.

Keywords: video monitoring, hongbao gifts, job satisfaction, perceived discrimination, domestic workers, labor control, mediating effect

INTRODUCTION

China has witnessed rapid economic growth and social development since the 1980s, and many women have entered the labor market. Consequently, in most Chinese cities, it is common for middle-class women to have jobs as well as families of their own. This has led to an increasing demand for domestic workers to do housework and to care for children and the elderly. Responding to this demand, migrant women from less developed areas have entered cities, and currently provide a large supply of domestic workers. Owing to the lack of professional norms, the expansion

of China's market for domestic work faces two prominent obstacles. First, employers currently lack standardized and effective guidelines for managing domestic workers. Second, domestic workers in China typically have low job stability and satisfaction.

It is important to study domestic workers' job satisfaction because it affects key areas of care needs and regulation of domestic services. In contrast to other service-based occupations, the rate of informal employment among domestic workers is very high (81.2%)—approximately twice the share of informal employment of other employees (39.7%) (1)—which is typical of unstable work. The high instability of domestic work is not only caused by this high rate of informal employment, but also by the ways that employers interact with domestic workers, and specifically their strategies of labor control. From an employer's perspective, the outsourcing of housework and the care of family members to a domestic worker can help alleviate the problems associated with the need to provide private care or the use of public care services, making it possible to achieve work-life balance (2). However, most employers have very limited knowledge about the means for controlling the labor process to maximize the benefits of outsourcing domestic work. Furthermore, labor controls shape the work experiences of domestic workers. Strategies of labor control that are too harsh may reduce the job satisfaction of domestic workers and lead to other negative consequences, such as low job performance (3), low organizational commitment (4), and a high turnover rate (5). These negative effects also represent the feedback of domestic workers on labor controls. Job satisfaction may also affect a domestic worker's motivation and service quality, which in turn affects the health and wellbeing of the recipients of domestic care (6). In general, low work satisfaction is unconducive to the formalization of domestic work and the development of service quality in this specific industry.

The literature suggests that the factors influencing the job satisfaction of domestic workers can be categorized into two areas: the personal characteristics of the domestic worker (e.g., gender, age, marital status, education level, and family background), and the working conditions (e.g., salary, promotion, supervision, and the working relationship) (6–10). Several scholars also emphasize the influence of social support, migration trajectories, work trajectories, and other factors (11–13). However, most of these studies suffer from at least one of the following problems: (1) they lack the perspectives of the immediate employers of domestic workers and their labor control strategies, and instead tend to focus on the employers at the organizational level (e.g., the agents); (2) they tend to be limited in their scope, focusing exclusively on domestic workers that are employed by institutions, or on those who are employed directly by private employers, but never both; and (3) they suffer from methodological limitations; for instance, most studies have been qualitative, and a few quantitative studies have used convenience sampling. Owing to the problems outlined above, limited generalizations can be made about the job satisfaction of domestic workers.

China is presently undergoing rapid change. On the one hand, traditional customs still shape social life; on the other hand,

modern technology—especially the Internet—has permeated all sectors of society. In a field survey for the present study, we find that in their interactions with domestic workers, employers in China use modern video-monitoring technology (reflecting a certain degree of distrust by the employer) and also engage in the traditional Chinese custom of "hongbao gifts" (i.e., the presentation of money in a red envelope as a gift; an act indicating intimacy). Accordingly, in this paper we seek to answer the following questions: How do these two contradictory behaviors achieve labor control over domestic workers? Specifically, we examine the impacts of employers' video monitoring (a "tough control") and hongbao gifts (a "soft control") on the job satisfaction of domestic workers. As we do not apply a specific sampling frame, we use the Respondent Driven Sampling (RDS) approach to overcome the lack of representation caused by convenience sampling.

LITERATURE REVIEW AND HYPOTHESES

The concept of "discipline" has a long history in the field of domestic work. Many studies document control strategies used by employers, such as fictive kinship, schedules, and accommodation arrangements (14–19). However, relatively few studies analyze the impacts of labor controls on the job satisfaction of domestic workers or examine the mechanisms by which these impacts unfold.

Tough Control: Monitoring *via* Video Cameras

Labor control is a core concept in labor process theory. Studies on labor control have mainly focused on organized workplaces (20–23). Although workplace monitoring has been proposed to improve employees' task performance (24), it can also have negative effects on employees (25), such as reducing their job satisfaction, wellbeing, and motivation, increasing their mistrust and other negative emotions, as well as promoting turnover (26, 27). Similarly, studies show that video monitoring can reduce the performances of the monitored persons in simple tasks (28), and create undesirable tension between managers and subordinates (29). Another negative consequence of video monitoring is a reduction in employee job satisfaction (25); this occurs especially when an employee perceives the monitoring as a violation of his or her privacy (30).

Disputes over labor monitoring are rife in domestic work owing to the privacy of the workplace as well as the lack of work standards and privacy protection. Thus, video monitoring may more likely have a negative impact on domestic workers. Domestic workers working in private households—especially those who live with their employers—frequently encounter difficulties in distinguishing between public and private boundaries. Many stay in their employers' houses throughout the duration of their contracts, where they may be made to share a room with the recipient of their care (31). Domestic workers are therefore vulnerable to privacy violations, and some may even lack privacy completely (32). As an "intimate stranger" in the home, the personal life and

moral character of a domestic worker is constantly subject to the scrutiny and supervision of their employers. In recent years, the popularization of low-cost monitoring equipment has provided numerous convenient methods for employers to monitor domestic workers (31). The use of telephones for supervision and the discreet installation of "hidden" recorders or cameras in homes to monitor domestic workers have become common practice (33). Such monitoring of domestic workers allows employers to visualize the labor process, though they typically justify their behaviors by claiming that the monitoring is necessary to ensure the safety of individuals in the home (34).

Our survey finds that many employers use cameras because of their low cost and convenience, and their ability to provide real-time monitoring with both images and sound. While employers insist that the cameras are being installed to monitor the recipients of care, domestic workers have shown mixed attitudes toward such installations (i.e., ranging from opposition to support). Only a few qualitative studies document domestic workers' views on video surveillance, such as their dissatisfaction with the installation of cameras (35), which violate their privacy and undermine their trust in their employers (34). However, it is not well known whether such video monitoring affects the work attitudes of domestic workers. We believe that examining the impact of video monitoring on the job satisfaction of domestic workers provides a more indirect indication of domestic workers' genuine attitudes toward video monitoring.

Accordingly, we propose the following hypothesis.

H1: The installation of video cameras in the home of the employer significantly lowers the job satisfaction of the domestic worker.

Soft Control: Hongbao Gifts

In traditional Chinese culture, "hongbao" are gifts in the form of cash in envelopes, which are presented for the purpose of maintaining relationships (36). Hongbao are generally used to consolidate social relationships. For instance, they can be used as a means for strengthening one's connection with relatives and friends, or to confirm one's personal relationships. In China's transformation from a traditional society of "acquaintances" to a modern society of "strangers," the custom of giving hongbao has extended beyond the scope of one's relatives and friends; it has penetrated the industrial and commercial environment, where it commonly modulates the relationship between employer and employee.

Monetary rewards have shown to improve employee job satisfaction in many different sectors of work (37, 38), and in particular, financial returns have been shown to enhance employee job satisfaction in emotional labor (39). In China, employers often give hongbao to their employees at the beginning and end of the year, as well as during major festivals and celebrations. Such hongbao-giving not only serves the purpose of providing the employee with an economic incentive, but also—and more importantly—enhances the emotional connection between employer and employee, thereby increasing the likelihood that the employee will adhere to the employer's subsequent instructions. For instance, one study finds that

presenting cash in the form of a hongbao rather than as ordinary cash, leads to a greater improvement in employees' overall productivity, willingness to participate, and work quality (40).

The custom of giving hongbao can likewise be beneficial to the construction of an informal relationship between employers and domestic workers. Some domestic workers are willing to establish an intimate relationship with their employers, and they may proactively pursue this. They may regard the development of intimate relationships as a sign of their employers' respect (41–43). From these intimate relationships, domestic workers may also derive emotional recognition, which they cannot obtain simply from their employment contracts (44). Research shows that acknowledgment indicates that the recipient is worthy of trust, respect, and appreciation (45). Additionally, employees' job satisfaction tends to increase when they perceive respect from their employers or managers (46, 47). We expect that similar direct psychological rewards induced by hongbao gifts will stimulate the transformation of relationships based on paid work to emotional relationships. In our opinion, as the medium of personal relationships, hongbao is the means used by employers to control the labor of domestic workers. Domestic workers who accept hongbao are more likely to be controlled by their employers. On the one hand, hongbao may have a positive impact on the labor process and results of domestic workers; on the other hand, it could consolidate unstable employment relationships of domestic service. Therefore, we predict that hongbao gifts will positively affect the job satisfaction of domestic workers.

H2: An employer's hongbao gift has a significant positive effect on the job satisfaction of the domestic worker.

Mediating Variable: Perceived Discrimination

Domestic workers are a stigmatized group (48, 49). Often, this discrimination relates to the gender or race of the domestic worker, or the enslavement traditions and class structure in the country of work (17, 50–52). The position of domestic workers on the fringe of the labor market also reflects the exclusive labor policies in some countries or districts (53, 54). These factors (gender, race, traditional class, and labor policies) also cause domestic workers to have low professional statuses in society, and make them a group vulnerable to discrimination. Furthermore, domestic workers are vulnerable to discrimination in the workplace. Interpersonal discrimination, a component of workplace discrimination, includes negative verbal and nonverbal behaviors that occur in daily social interactions in the workplace (55). In comparison with other employees in the service industry, domestic workers spend greater amounts of time with their employers, interact more frequently, and are more likely to be the subjects of interpersonal discrimination. For instance, employers who play the roles of benevolent mothers believe that their domestic workers are weaker than themselves, and therefore need to be protected. Such employers confirm their class status and superiority in daily dealings (14, 56, 57). In contrast, their domestic workers may

perceive discrimination. One meta-study shows that perceived discrimination is significantly related to job satisfaction (55).

Numerous laws make clear provisions on discrimination in the workplace to prevent workers from being treated unfairly. Nonetheless, workplace discrimination continues to be manifested in inconspicuous behaviors and attitudes, placing the recipient of such discrimination at a considerable disadvantage. As suggested by Jones et al. (58) while public discrimination is resisted by society, subtle discrimination is difficult to define and eliminate. Because employers in the private sector possess considerable power to decide and interpret their actions, it is difficult to judge their true intentions owing to the unclear boundaries between that which is "public" and that which is "private." It is also difficult to determine whether certain behaviors of employers toward domestic workers are shaped by prejudices. Therefore, domestic workers' perceptions may influence their understanding and interpretation of the behaviors of their employers. Cameras capture the real-time labor process of domestic workers. Such video monitoring may cause domestic workers to feel as though they are being discriminated against by their employers, thereby reducing their job satisfaction. For instance, a recent study shows that electronic monitoring affects employee satisfaction by changing employee cognition (59). Likewise, we expect that video monitoring will affect the job satisfaction of domestic workers (i.e., through their respective attitudes to video monitoring). In contrast, we expect that the potential signs of gratitude and the recognition that employers convey through giving hongbao will reduce the discrimination perceived by domestic workers, thereby improving their job satisfaction.

Accordingly, the following hypotheses are proposed.

H3: Perceived discrimination mediates the effect of video monitoring on job satisfaction.
H4: Perceived discrimination mediates the effect of hongbao gifts on job satisfaction.

Material factors, such as an adequate compensation or a safe and comfortable physical environment, are key to ensuring the job satisfaction of domestic workers (60). If video monitoring—which is a "tough" means for controlling the labor of domestic workers—destroys the safety and comfort of the working environment; in contrast, hongbao gifts—a kind of "soft" control strategy—are a form of economic and psychological compensation that employers present to their domestic workers. We expect that employers' labor control over domestic workers can be strengthened *via* the use of either "tough" or "soft" strategies.

Based on the above discussion, we propose a research framework (**Figure 1**).

METHODS

Data and Respondents

The research data originated from a questionnaire-based survey on domestic work, which was conducted in four cities in China (Nanjing, Wuxi, Guangzhou, and Foshan) from June to August 2019. The surveys were conducted by the "Research

on the Employment of Domestic Workers in the Internet Era" research group in the School of Social and Behavioral Sciences, Nanjing University. Domestic workers are usually employed in an informal capacity and many are not officially registered. For this reason, a sampling frame of domestic workers was difficult to obtain. We used the RDS approach in the survey to address this problem, "because standard probability sampling methods produce low response rates and responses that lack candor" (61). RDS is a network sampling technique that is typically employed to sample hidden populations that lack a sampling frame (62). The results of the RDS indicated that the dataset was representative. We explained the purpose of the research and obtained the informed consent from each participant prior to the survey.

The respondents were domestic workers who had been serving in their employers' houses for extended periods of time (i.e., more than or equal to 3 months). To reduce potential sources of bias in our analysis, our surveys excluded domestic workers who had worked for their employers for short periods of time (i.e., <3 months), or who were paid by the hour, as such domestic workers usually served multiple employers during the same period. We also excluded eight domestic workers who were male, because these samples insufficiently represented the population of male domestic workers. Our final sample consisted of 699 domestic workers who ranged between the ages of 28 and 70 years (M = 50.84, SD = 6.62). Approximately 88.4% of the respondents were married, and more than 70% of them originated from rural areas. The majority of respondents (86%) had a junior high school or lower educational level.

Measurements
Dependent Variable
Job Satisfaction
The "overall job satisfaction scale" developed by Tsui et al. (63) is among the most widely used by researchers[1]. The scale includes six items that measure an individual's satisfaction with his or her work performance, organizational superiors, relationships with co-workers or peers, income, and promotion opportunities, as well as the overall job satisfaction. Domestic workers typically do not maintain any relationships with their co-workers (as these usually do not exist in the homes of their employers) or their superiors, and job promotions are extremely rare. Accordingly, we modified the scale by eliminating the item measuring the individual's satisfaction with a co-worker-relationship, and replacing the items measuring the individual's satisfaction with the superior-relationship and promotion opportunities with items that measured the individual's satisfaction with the employee–employer relationship and the occupational status. Thus, our modified scale included a total of five items; it measured a domestic worker's satisfaction with her job performance, income, employee–employer relationship and occupational status, as well as her overall job satisfaction. Respondents' answers to each item were rated on a five-point Likert scale that ranged from a value of 1 ("very dissatisfied") to

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[1]Given the differences between domestic work and other occupations, we did not choose a complicated job satisfaction scale.
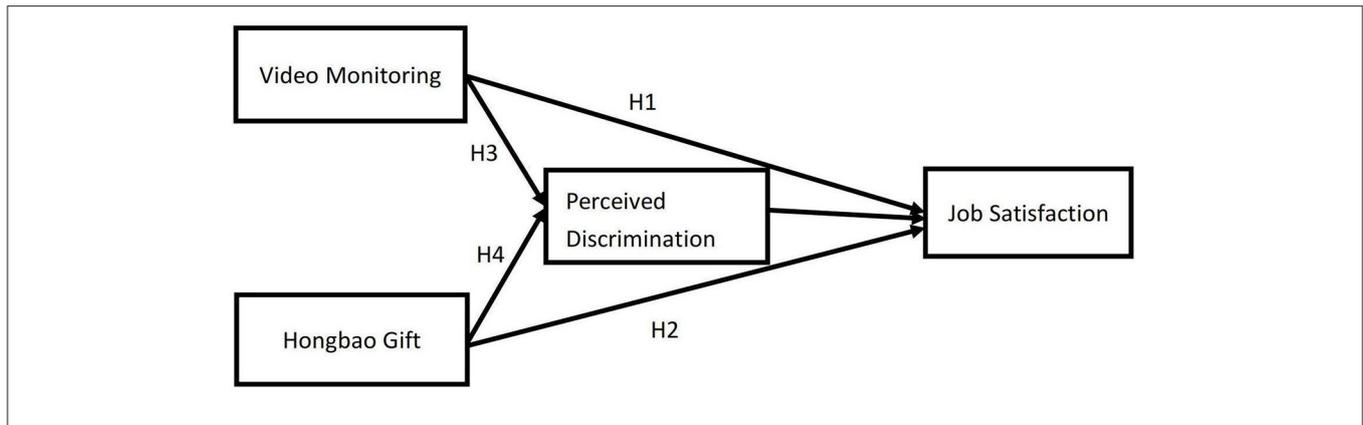
FIGURE 1 | Impact mechanism of the effects of video monitoring and hongbao gifts on the job satisfaction of domestic workers.

a value of 5 ("very satisfied"). The Cronbach's alpha for the scale was 0.75, and the KMO was 0.763 ($p < 0.001$); this indicated that the scale had satisfactory reliability.

Independent Variables

Video Monitoring

The participants were asked "Does your employer have a video camera installed in the home at present?" The response items were "yes," "no," and "unsure." Among the domestic workers surveyed, 25% of the participants clearly stated that their employers had video cameras installed in their homes, 66.48% said that their employers had not installed such devices, and 8.06% said that they were unsure as to whether any such devices had been installed. We combined the data for the "no" and "unsure" responses and coded them with a value of 0; we coded the "yes" responses with a value of 1.

Hongbao Gift

The participants were asked "Did you receive a hongbao from your employer in the previous year?" The response items were "yes" and "no." If a participant answered "yes," she was subsequently asked to state the monetary value of the hongbao she received. Among the domestic workers surveyed, 62% reported receiving hongbao from their employers. The values of hongbao received ranged from 5 to 10,000 yuan (M = 1,084.18, SD = 1,480.04). We used hongbao value (in yuan) as an independent variable, coded participants who had not received hongbao with a value of 0, and performed logarithmic processing (M = 3.92, SD = 3.2).

Mediating Variable

Perceived Discrimination

We measured the discrimination the domestic workers perceived by asking the question "Have you ever felt discriminated against because of your status as a domestic worker?" For the response items, we used a five-point scale, which ranged from a value of 1 ("never") to a value of 5 ("always"). Among the domestic workers surveyed, 61.39% reported "never" feeling discriminated against; while 21.92%, 10.33%, and 6.36% of the domestic workers reported feeling discriminated against "occasionally,"

TABLE 1 | Descriptive statistics for the control variables (N = 699).

Variable	Mean	Std. dev.	Min	Max
Age	50.84	6.63	28	70
Years of education	8.17	2.96	0	16
Household registration (urban = 1)	0.26	0.44	0	1
Marital status (married = 1)	0.88	0.32	0	1
Years of work as a domestic worker	7.77	6.53	0	38
Type of work	0.17	0.38	0	1
Housework = 0				
Child care = 1	0.50	0.50	0	1
Elderly care = 2	0.33	0.47	0	1
Live-in or live-out domestic worker (live-in = 1)	0.74	0.44	0	1
Employment contract (yes = 1)	0.56	0.50	0	1
Monthly salary (logarithmic)	8.46	0.41	6.91	9.79

"sometimes," and "often" or "always," respectively. We treated Perceived Discrimination as a binary variable, that is, coding a response of "never" with a value of 0, and all other responses with a value 1.

Control Variables

Our model controlled for any variables that corresponded to participants' sociodemographic characteristics and work statuses (**Table 1**). The social demographic variables included the age, years of education, household registration (rural = 0, urban = 1), and marital status (unmarried = 0, married = 1) of each participant. The variables corresponding to participants' work statuses included the number of years for which they had worked as domestic workers (i.e., a continuous variable, in years), the type of work they performed (housework = 0, child care = 1, elderly care = 2), whether they were living in their employer's house (no = 0, yes = 1), whether they had signed a contract with their employer (no = 0, yes = 1), and their monthly salary (logarithmic).

Data Analysis

We used a structural equation model (SEM) in the software Stata16 to estimate the relationships between Video Monitoring, Hongbao Gifts, Perceived Discrimination, and Job Satisfaction. As the mediating variable Perceived Discrimination was a binary variable, we used the "gsem" command in Stata16 to fit this binary variable to estimate the model parameters. However, the "gsem" command could neither directly report the goodness-of-fit for the model, nor calculate the direct, indirect, or total effects. Therefore, in a second analysis, we included Perceived Discrimination as a continuous variable. We used the "SEM" command to estimate the model parameters in a linear probability model, and calculated the model's goodness-of-fit, and the direct, indirect, and total effects. Finally, we used the bootstrap method to estimate the direct, indirect, and total effects of the independent variables.

RESULTS

The results of the SEM estimated using the maximum-likelihood method are presented in **Table 2**. Perceived Discrimination was estimated using a logit model in Model 1 and using an OLS model in Model 2. Based on the results of the goodness-of-fit indices, both the SRMR and RMSEA of Model 2 were <0.05, indicating a good fit. However, the values of log-likelihood, AIC and BIC in Model 1 were smaller than those of Model 2, indicating that a better fit was achieved using the logit model.

In both Models 1 and 2, the factor loadings of the four latent variables were all significant at the 5% level, indicating that the measurement model was effectively accepted. Models 1 and 2 both showed that the installation of video monitoring in employers' homes had no significant impact on domestic workers' job satisfaction. However, Video Monitoring showed a significant positive effect on perceived discrimination ($p = 0.01$). That is, domestic workers who were subject to video monitoring were more likely to perceive themselves as being discriminated against. This result indicated that video monitoring did not directly impact the job satisfaction of domestic workers, but had an indirect negative impact on their job satisfaction through the mediating effect of perceived discrimination.

The estimated coefficient for Hongbao Gift indicated that it had a positive effect on the job satisfaction of domestic workers ($p = 0.001$). Specifically, for every 1% increase in Hongbao Gift, Job Satisfaction increased by 2.8%. Hongbao Gift also had a significant negative impact on Perceived Discrimination ($p = 0.01$). That is, a domestic worker who received a hongbao gift of greater value from her employer was less likely to feel discriminated against. Furthermore, Perceived Discrimination was found to have a negative impact on the job satisfaction of domestic workers ($p = 0.001$). Domestic workers who had perceived discrimination experienced 25.8% lower job satisfaction than others who had never perceived discrimination. The results showed that in addition to directly promoting job satisfaction, hongbao gifts could also promote job satisfaction indirectly by reducing perceived discrimination.

To obtain the total (i.e., net) effect of Hongbao Gift, Video Monitoring, and Perceived Discrimination on Job Satisfaction, we reported their standardized coefficients based on Model 2 (as shown in **Table 3**).

With reference to the standardized coefficients in **Table 3**, we found that the direct effect of Video Monitoring on Job Satisfaction was not significant. Instead, we found that its indirect effect and total effect were both significantly negative at the 0.05 level (-0.029, $p = 0.014$; and -0.097, $p = 0.025$, respectively). This indicated that Video Monitoring reduced Job Satisfaction through Perceived Discrimination, in a complete mediation effect. Hongbao Gift had both a positive direct effect (0.209, $p = 0.000$) and a positive indirect effect (0.034, $p = 0.006$) on Job Satisfaction. The sum of the two variables—Video Monitoring and Hongbao Gift—yielded the total effect on Job Satisfaction (0.243, $p = 0.000$). These results show that the role of Hongbao Gift on Job Satisfaction is part of the mediating effect.

DISCUSSION

There is an urgent need to promote the job satisfaction of domestic workers in China due to the increasing demands for housework and care, as well as the low professional standards of domestic work and the high mobility of domestic workers in the country. In this study, we investigate how domestic workers' job satisfaction is influenced by two labor control strategies used by Chinese employers: video monitoring, which has rapidly become popular in the private sector, and hongbao gifts, which have the function of embedding personal relationships within formal relationships. The former strategy of labor control uses cameras to extend panopticism to the private space; the latter is a means for employers to exploit "strategic intimacy" (64) and control domestic workers to ensure their service quality, or to seek unpaid labor (65). In addition, we find that domestic workers' perceptions of employer behaviors, specifically whether domestic workers feel discriminated against, play an important role in the impact of labor control on job satisfaction.

Applying SEM to data from surveys of domestic workers in four cities in China, we examine how the two labor control strategies—the installation of video cameras in the home for monitoring purposes and the giving of hongbao to domestic workers—affect the job satisfaction of domestic workers. The results verify our hypotheses that video monitoring and hongbao gifts significantly impact domestic workers' job satisfaction. Specifically, we find that video monitoring negatively affects domestic workers' job satisfaction and this relationship is completely mediated by perceived discrimination. In contrast, hongbao gifts not only directly and positively affect domestic workers' job satisfaction but also have an indirect positive effect by reducing perceived discrimination.

The installation of video cameras in the home completely exposes the labor process of a domestic worker to an employer. Decisions on whether and where to install such cameras—and whether to inform and obtain the consent of domestic workers— lie with individual employers. The uncertainty about the number and locations of cameras, as well as the unknown identities

TABLE 2 | Results of SEM analysis for domestic workers' job satisfaction.

		Model 1	Model 2
A. Measurement model			
Job satisfaction	Job performance		
	_cons	2.761***(0.545)	2.761***(0.545)
	Income	1.269***(0.141)	1.269***(0.141)
	_cons	1.751*(0.692)	1.751*(0.692)
	Employee–employer relationship	1.125***(0.113)	1.125***(0.113)
	_cons	2.704***(0.601)	2.704***(0.600)
	Occupational status	1.379***(0.143)	1.379***(0.143)
	_cons	1.911**(0.733)	1.911**(0.733)
	Overall job satisfaction	1.002***(0.080)	1.002***(0.080)
	_cons	2.957***(0.540)	2.957***(0.540)
B. Structural model			
—> Perceived discrimination		(Logit model)	(Linear probability model)
Video monitoring (no or unsure = 0)		0.320**(0.121)	0.076**(0.028)
Hongbao gift (logarithmic)		−0.074**(0.024)	−0.017**(0.006)
_cons		−0.317*(0.132)	0.422***(0.031)
—>Job satisfaction			
Perceived discrimination (never = 0)		−0.258***(0.042)	−0.258***(0.042)
Video monitoring (no or unsure = 0)		−0.045(0.028)	−0.045(0.028)
Hongbao gift (logarithmic)		0.028***(0.006)	0.028***(0.006)
Age		0.007*(0.003)	0.007*(0.003)
Years of education		−0.006(0.007)	−0.006(0.007)
Household registration (urban = 1)		0.028(0.045)	0.028(0.045)
Marital status (married = 1)		0.074(0.056)	0.074(0.056)
Years of work as a domestic worker		0.003(0.003)	0.003(0.003)
Type of work			
Housework = 0		−0.057(0.055)	−0.057(0.055)
Child care = 1		−0.172**(0.058)	−0.172**(0.058)
Elderly care = 2		0.031(0.044)	0.031(0.044)
Live-in or live-out domestic worker (live-in = 1)		−0.024(0.036)	−0.024(0.036)
Employment contract (yes = 1)		0.163**(0.058)	0.163**(0.058)
C. Goodness-of-fit indices			
		Log likelihood = 4347.209; AIC = 8760.418, BIC = 8910.932	Log likelihood = −14855.129; AIC = 29778.259, BIC = 29933.334; SRMR = 0.038, RMSEA = 0.044; R-squared = 0.158
N		699	699

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

of the observers and the duration of monitoring make video monitoring more invasive than other forms of monitoring (34). The professional and private lives of domestic workers overlap considerably in both time and space, and it is difficult for these individuals to find "safe spaces" where they can escape the camera's uninterrupted gaze. The installation of video cameras in homes therefore causes domestic workers to worry about privacy violations and to believe that they are not trusted by their employers.

It is worth noting that the domestic workers' perceived discrimination completely mediates the effect of video

monitoring on their job satisfaction. This suggests that the video camera stimulates a domestic worker's perception of discrimination, and negatively affects her job satisfaction through this mechanism. Prior to entering employment in a private household, some domestic workers may already be aware that their occupation is discriminated against, as domestic work is sometimes treated as a "dirty" or "inferior" form of work. This perception may change in response to the behavior of the employers. More than half of the domestic workers surveyed indicated that they found it acceptable for their employers to install video cameras in their homes. However, this does not

TABLE 3 | Standardized direct effects, indirect effects, and total effects of hongbao gifts, video monitoring, and perceived discrimination on the job satisfaction of domestic workers.

	Std. Coef.	Std. Err.	Z	P
Standardized direct effects				
Video monitoring —> Job satisfaction	−0.067	0.028	−1.62	0.105
Hongbao gift —> Job satisfaction	0.209	0.006	4.65	0.000
Video monitoring —> Perceived discrimination	0.100	0.028	2.690	0.007
Hongbao gift —> Perceived discrimination	−0.114	0.006	−3.080	0.002
Perceived discrimination —> Job satisfaction	−0.294	0.042	−6.17	0.000
Standardized indirect effects				
Video monitoring —> Job satisfaction	−0.029	0.008	−2.470	0.014
Hongbao gift —> Job satisfaction	0.034	0.002	2.750	0.006
Standardized total effects				
Video monitoring —> Job satisfaction	−0.097	0.029	−2.250	0.025
Hongbao gift —> Job satisfaction	0.243	0.006	5.180	0.000
Video monitoring —> Perceived discrimination	0.100	0.028	2.690	0.007
Hongbao gift —> Perceived discrimination	−0.114	0.006	−3.080	0.002
Perceived discrimination —> Job satisfaction	−0.294	0.042	−6.170	0.000

eliminate the negative effects of such monitoring. Domestic workers' attitudes toward cameras reflect their recognition of their own identity as "others" and their lack of "voice" in the private family. This represents a helpless and passive acceptance of the asymmetrical power relations. Some domestic workers even see video monitoring as a means to prove their integrity and to advertise their service quality. For instance, one worker caring for newborns and their mothers squared her shoulders and stated that she "very much supported (her employer installing a video camera in the home)" because "a clean hand wants no washing," and thus video monitoring could help her employers address any suspicions they might have had concerning her integrity.

Hongbao gifts are not only means for employers to encourage domestic workers to work hard and work more, but are also concrete representations of personal relationships in the Chinese context. The efficacy of hongbao gifts in domestic services can operate through the following channels. First, hongbao have economic value. In contrast to non-monetary gifts with less tangible economic values, the economic returns or compensation represented by a hongbao is clear. Second, hongbao act as incentives, conveying employers' recognition and endorsement of the work quality or personality of domestic workers, and their expectations for subsequent high-quality services, which may motivate the domestic workers. Third, hongbao act to embed emotional connections within a contractual relationship based on market logic. In traditional Chinese culture, the giving and receiving of hongbao takes place primarily during the Spring Festival, and is an intergenerational gift. In this context, hongbao represent the blessing of the giver on the recipient, and serves to reinforce the bonds with one's family, relatives, and friends. In contrast, the timing of employers' hongbao are not fixed; they may be presented on holidays or on the birthdays of domestic workers. In this context, hongbao represent employers' blessings and gratitude to domestic workers, strengthening the emotional connections between the two parties. This emotional connection, as well as the variable timing at which hongbao are presented,

blurs the perception of unequal status in the employer–employee relationship, even providing domestic workers with some psychological return and increasing their loyalty. Finally, hongbao can function as a medium for personal relationships and thus reduce the mobility of domestic workers and stabilize their employment. In contrast to foreign domestic workers who operate in conditions of "legal servitude" (66), domestic workers encounter low costs in changing jobs in mainland China, allowing them relatively high mobility. The service quality of domestic workers in the current market varies considerably, and it is difficult to find "good" domestic workers. Labor controls such as video monitoring that potentially risk violating human rights may become reasons for domestic workers to actively terminate their contracts. In contrast, hongbao gifts are taken to represent the favor and face of the employers. In Chinese culture, gifts help to maintain the informal relationship between the two interacting parties. A rejection of a gift is interpreted as the rejection of the giver's kindness; such actions risk damaging the face of the giver and destroying the relationship. Therefore, employers use hongbao gifts and foster personal relationships to ease the inherent tension in domestic services. These labor controls can act as soft constraints on domestic workers' abilities or willingness to leave their jobs, and therefore reduce their mobility. In addition to increasing the income and internal motivation of domestic workers, which increase directly with their job satisfaction, the psychological return of respect and recognition brought about by hongbao gifts reduces domestic workers' perceptions of discrimination, and indirectly promotes their job satisfaction.

In summary, our research demonstrates the distinct effects of tough labor controls and soft labor controls on the job satisfaction of domestic workers and verifies the mediating effect of domestic workers' cognition (i.e., perceived discrimination). In addition, our analysis of domestic workers' perceptions of discrimination aligns with the conclusions of previous studies, which show that discrimination at work negatively impacts

an individual's job satisfaction (4, 67–69). The two strategies continue to strengthen the labor control of domestic workers. The camera has introduced a novel, accessible means of labor control to employers—precisely at a time when few are able to supervise the work of domestic workers because of their own work commitments. The positive signals conveyed by hongbao gifts substantiate employers' gratitude in exchange for the work of domestic workers. However, hongbao are nonetheless a disguised form of labor control, designed to offset or alleviate the negative perceptions and work attitudes brought about by video monitoring.

Our study makes three main contributions. First, we incorporate video monitoring, hongbao gifts, and perceived discrimination into an analytical framework for understanding the labor processes of domestic workers; we discuss employers' tough- and soft control strategies and the mechanisms through which domestic workers' cognition impacts their job satisfaction. Second, our study highlights how domestic workers' identities are shaped by modernity and society and emphasizes the influence of employers' behaviors on the attitudes of domestic workers to their jobs. Third, our quantitative analysis using the representative samples obtained by RDS sampling complements qualitative research on domestic work.

To be clear, we are not calling for the prohibition of video monitoring or recommending that all employers present hongbao gifts to their domestic employees. Instead, by examining the impacts of two labor control strategies on the job satisfaction of domestic workers, we wish to draw attention to the subjective experiences of domestic workers. As one important limitation, the present research does not account for differences in the types of employment relationships, which have shown to play an important role in shaping employers' choices and motivations for labor control strategies, as well as the responses of domestic

workers (64). However, owing to limitations in the data, we do not consider different types of employment relationships and their complex interactions; neither do we account for the emotional experience between employers and employees in this study. In addition, the symbolic meanings of hongbao gifts vary across different regional cultures in China. Such regional and cultural differences may influence domestic workers' perceptions of hongbao, and thus altering hongbao effects on job satisfaction and job performance. Future studies may therefore expand on the scope of the present research by exploring how the effects of different types of employment relationships and their interactions, the emotional experiences of employers and employees, and regional culture influence labor controls of domestic workers and their attitudes toward these controls.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be provided by the corresponding author upon request.

AUTHOR CONTRIBUTIONS

LL contributed to the conceptualization and revision. AY and SF contributed to methodology and writing the manuscript. CF conducted the data analyses and critically revised the manuscript. MJ reviewed and edited the manuscript. All authors reviewed and approved the submitted version.

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The Impact of Artificial Intelligence on the Mental Health of Manufacturing Workers: The Mediating Role of Overtime Work and the Work Environment

WanQing Wei[1,2]* and LinYu Li[1]

[1] School of Public Administration, Guangxi University, Nanning, China, [2] Regional Social Governance Innovation Research Center, Guangxi University, Nanning, China

Background: Work-related mental health and psychological injuries are important issues related to people's livelihood and wellbeing. Currently, digitalization and intelligent technology have an extremely large impact on the workforce. China is actively promoting the deep integration of artificial intelligence (AI) and manufacturing, which may have important implications for the mental health of manufacturing workers. However, existing researches have paid little attention to the influence of AI on the mental wellbeing of workers in China. There is a lack of relevant empirical research, and the findings in existing studies are inconsistent.

Methods: Using data from the 2018 China Labor Force Dynamics Survey, this paper studies the impact of AI on the depressive symptoms of manufacturing workers and uses stepwise and bootstrapping methods to test whether overtime work and the work environment exhibit mediating effects. Robustness tests were performed by using alternative measures for the dependent and mediating variables. Finally, the heterogeneity in the impact of AI by skill level and generation was examined.

Results: AI can reduce the psychological depression scores of manufacturing workers by 1.643 points, which indicates that AI promotes workers' mental health. Working overtime is not a mediator between AI and mental health. However, the work environment is a mediator between AI and the mental health of manufacturing workers: it explains 11.509% of workers' mental health. The impact of AI on the mental health of manufacturing workers varies by skill level and generation. AI improves the mental health of low-skilled manufacturing workers by 2.342 points and that of manufacturing workers born before the 1980's by 2.070 points.

Conclusions: The application of AI is conducive to improvements in the mental health of manufacturing workers. Improving the work environment is a powerful way to increase the positive effects of AI on workers' mental health. The impact of AI on the mental health of manufacturing workers varies by skill level and generation. The mental health of low-skilled workers and workers born after 1980 is affected more positively by the adoption of AI.

Keywords: artificial intelligence, mental health, overtime work, work environment, manufacturing industry

INTRODUCTION

Since 2015, the Chinese government has promoted a master plan entitled "Made in China 2025," which emphasizes the development of "intelligent manufacturing" through the utilization of AI (1, 2). China's AI industry reached 303.1 billion yuan in 2020, up 15% year-on-year, which indicates growth that is slightly faster than the global growth rate. In the Chinese context, the rapid adoption of AI in manufacturing is bound to have profound impacts on working conditions, labor relations, and the mental health of employees (3). Therefore, it is highly important that the ways in which the adoption of AI affects Chinese manufacturing employees' mental health is explored. However, there are few empirical studies on this topic. Moreover, although some researchers have begun to study the impact of AI on workers, their findings are inconsistent and even conflicting. On the one hand, some researchers view the utilization of AI as an important way to alleviate the "contradiction between family and work" and to achieve "balance between family and work" (4, 5). Therefore, they are optimistic about the impact of AI on workers' mental health. On the other hand, other researchers have argued that technological upgrading is being used as a strategy to substitute capital (i.e., technology) for labor in the face of increasing labor bargaining power and labor costs (6). AI helps reduce dependence on workers by replacing jobs and reducing the need for human labor. Moreover, "deskilling" through AI reduces the bargaining power of workers (7). Thus, AI changes the balance of power in labor-capital relations through employment substitution and deskilling, which further increases the pressure on workers to remain employed and negatively impacts their mental health (8).

Given the literature reviewed above, this paper explores the impact of AI on the mental health of employees in the Chinese manufacturing industry. Specifically, we focus on the following questions. First, how does the adoption of AI in manufacturing affect the mental health of employees? At this stage, is the use of AI beneficial or detrimental to the mental health of employees? Second, if the utilization of AI has a significant effect on the mental health of employees, what is the specific mechanism or pathway by which this effect occurs? Furthermore, is this impact balanced across workers with different skill levels and in different generations? After combing the literature that explains the effects of AI on employment and on mental health, we argue that in its current stage, intelligent development in the manufacturing industry is mainly used as a substitute for some highly labor-intensive jobs and jobs with unfavorable working environments. Such substitution helps increase work efficiency and improve work environments in the manufacturing industry. Simultaneously, given the labor shortage in the manufacturing industry, the impact of employment pressure on workers' psychological health is extremely limited. This paper uses nationally representative data from the *China Labor Force Dynamics Survey* (CLDS) to answer the above questions.

The possible contributions of this paper are as follows. First, against the background of labor shortages and rising labor costs, AI adoption become important for the Chinese manufacturing industry. Given this context, the ways in which AI affects workers'

psychological health need scholarly attention. This is an issue that must be addressed through government management, policy research and adjustments to labor relations in the current digital and intelligent technology era. However, relevant research is still lagging behind. This paper focuses on the impact of AI on workers' mental health, which is a forward-looking concern. Second, this paper emphasizes the key roles of overtime work and the work environment in mediating the effect of AI on mental health, which contribute to our understanding of the mechanisms underlying AI's impact on mental health. Third, this paper focuses on the heterogeneity in the impact of AI on mental health and finds that this impact varies according by skill level and generation.

The remainder of this paper is organized as follows. In Literature Review and Research Hypotheses, we review the literature that focuses on the impact and mechanism of AI on the mental health of manufacturing workers and propose our research hypotheses. Data, Variables and Models describe our data source, data processing, variables and model setting, as well as our analytical strategy. Results analyse the empirical results, focusing on results related to our hypotheses about the relationships between AI and workers' mental health, the roles of overtime work and work environment in AI on mental health of manufacturing workers.

In Further Discussion: Heterogeneity Analysis, we further explore the heterogeneity in the impact of AI on the mental health of manufacturing workers in terms of skill differentiation and generational differences. Finally, we draw our conclusions.

LITERATURE REVIEW AND RESEARCH HYPOTHESES

The Impact of AI on Manufacturing Workers' Mental Health

Digitalization and intelligent technology, as the key forces driving the change in the relationship between production and life, have garnered attention and aroused debate in academic circles. Due to rising labor costs and labor shortages, intelligent technology has become widespread in the manufacturing industry, and the deep integration of intelligent technology and manufacturing has become commonplace. However, the academic community has lacked acumen in its attempts to answer the question of how this trend impacts workers' mental health, and conclusions are inconsistent.

Some scholars have explained the impact of AI–manufacturing integration on workers' mental health from the perspective of labor-capital relations and have drawn pessimistic conclusions. They have argued that the intelligentization of manufacturing will reduce workers' employment opportunities and wage bargaining power through technical unemployment and deskilling, which will negatively impact workers' mental health. In the context of labor shortages, intelligent development is a strategy by which capital in the form of technology can be used as a substitute for labor to weaken laborers' bargaining power and reduce labor costs. AI is expected to accelerate innovation and productivity growth. Under the assumption of

rationality, enterprises can be expected to increase their use of AI and reduce their labor demand (9). Unlike the limited substitution of specific work tasks during the previous industrial and digital revolutions, AI aims to replace, supplement and/or amplify almost all tasks performed by humans. Therefore, the impact of AI on employment is expected to be stronger than that of the previous technological revolutions (10). AI is not only expected to replace jobs in the labor market but also to change the ways in which all occupations complete their tasks, leading to massive technology-driven unemployment in the future (11, 12). Some scholars have found that empirically, industrial robots have had a greater impact than capital and other technological advances on the U.S. labor market, and the use of industrial robots has had a stronger negative impact on the employment-to-population ratio and the wage level in some U.S. industries (13). In the next 10 or 20 years, approximately 47% of the U.S. workforce is projected to be at high risk for computerization, a figure that includes not only workers in the transportation, logistics and production industries but also most office and administrative support workers (14). In addition, with the rapid development of AI, experts predict that in the next 30 years, AI will transition into super AI, which has one-third probability of negatively influencing humans (15). With AI approaching or reaching human levels of intelligence, it competes fiercely with workers for job opportunities, aggravating the uncertainty in the labor market. Workers are constantly worried about losing their jobs, seeing their incomes fall, and being exposed to economic insecurity. These factors threaten workers' mental health (16). Moreover, AI is expected to impact the traditional career paths of workers, and workers are more likely to respond with resignation, cynicism and depression (17). In addition, due to the replacement of workers with AI, unemployed individuals may experience prolonged unemployment spells and may even fall into permanent unemployment, which will further hinder their ability to meet their social and psychological needs and lead to the deterioration of their mental health.

Some scholars have criticized the above views, arguing that existing research overestimates the potentially destructive power of AI over employment. In contrast, they argue, AI enhances workers' positive emotions by creating jobs, improving efficiency, and increasing incomes. The potential destruction of employment due to AI can also benefit humans, and these benefits will improve mental health. Given that in most jobs, it is difficult for AI to quickly acquire the large amount of tacit knowledge that is needed, the impact of AI on employment has been limited, and only a few occupations are likely to become fully automated in the short or medium term (18). The relatively low average rate of job automation in 21 OECD countries also provides empirical proof for this (19). The jobs that AI replaces or eliminates often involve specific tasks. In other words, not all human jobs can be replaced (20). These jobs usually involve dull, dirty and dangerous work that is not suitable for human beings to engage in (21). The application of AI can help workers remove themselves from work that they dislike and give them more time to do things that they enjoy (22). It has been demonstrated that the long-term use of AI contributes to increased employment and reduced working hours (23). The destructive power of AI on future employment could be offset by continuous growth in productivity and real incomes (24). In addition, with the creation of a large number of "pleasant jobs" (25), the quality of workers' employment could be much improved, and positive life events that improve the mental health of workers could become more frequent. In addition, technological change promotes the growth of workers' income and further improves the average happiness of workers (26). Although AI is able to perform intuitive and empathetic tasks, it will still take time for AI to replace workers engaged in lower-level tasks, take over some jobs, or even completely supersede human labor (27). This threat of the complete replacement of human labor can be mitigated through appropriate regulatory measures. In a sense, it can also enhance the subjective wellbeing of individuals (28). In conclusion, optimistic scholars believe that AI is more creative than destructive in terms of the economy and society and that its destructive power is controllable. According to these scholars, the widespread use of AI is conducive to increasing the positive life events that improve workers' emotions and effectively improve their mental health.

Currently, AI has not been fully, deeply integrated into the Chinese manufacturing industry (29). Chinese manufacturers have a limited understanding of AI, and they usually use AI to replace certain heavy and mechanical tasks. The methods with which AI is applied are relatively simple (30), and AI integration is not yet sufficiently developed to replace all human work. This means that there has been no large-scale abuse of AI in the manufacturing industry thus far, and AI had a relatively small influence on the negative life events that affect workers' emotions. Moreover, the destructive impact of AI on the mental health of manufacturing workers can be minimized through the provision of lifelong education, increased free time, and the issuance of a universal basic income, which would improve workers' mental health to a certain extent.

In light of this discussion, we propose Hypothesis 1: Compared with workers in manufacturing enterprises that do not use AI, workers in manufacturing enterprises that do adopt AI have significantly improved mental health.

Mechanism by Which AI Affects the Mental Health of Manufacturing Workers

Regarding the adoption of AI, one view is that enterprises need AI to improve their output efficiency and remain competitive in the market. Therefore, holding circumstances constant, the use of AI improves work efficiency and reduces employee overtime. AI, robots, machine algorithms, etc., can continue to work 24 h a day with a low probability of work accidents and without the need to pay overtime wages, and thus can supplement or even replace the overtime hours of workers. A reduction in overtime hours can help reduce depression and improve mental health. Based on this, we propose Hypothesis 2: The use of AI reduces the probability of overtime work, which in turn benefits workers' mental health.

However, this view has been questioned. Another perspective emphasizes that the appropriate use of AI is to compensate for labor shortages and that the adoption of AI is an alternative measure taken because of the shortage of labor. The greater

the labor shortages of enterprises are, the more likely those enterprises are to use AI. The scale of AI adoption is limited. Therefore, in the current Chinese manufacturing industry, the use of AI and overtime work among employees are likely to coexist. In this context, AI is often used first for jobs for which it is difficult to recruit workers and that have a poor working environment. Currently, the scenarios in which AI is applied typically involve dangerous and dirty work environments. Rapid changes to the work environment could have an impact on the occupational safety and health of workers. Existing research has found that AI does play an important role in improving certain aspects of the work environment. In particular, AI increases the flexibility, safety, and convenience of the working environment. Robots are commonly used in harsh, dangerous, inaccessible or unsafe work environments to improve workers' safety as well as their efficiency, productivity and flexibility (31). For example, the application of cutting-edge AI technologies in the mining industry to improve mineral exploration, mine planning, equipment selection, underground and surface equipment operation, drilling and blasting, and mineral processing could help create a safer and more efficient work environment (32). In the construction industry, occupational health and safety management systems can identify hazardous situations and respond autonomously, helping to improve the occupational health and safety of construction workers (33). The application of AI subfields to other aspects of the construction industry has also played a significant role in improving job safety, accuracy, and efficiency (34). In nuclear power plants, AI can reduce the frequency of human error and improve job safety (35). In automated industrial vehicles, the intelligent system controls factors such as speed and distance, thus reducing driver error; as a result, the probability of accidents is extremely low, which ensures the safety of the work environment. In addition, AI is often used to replace labor-intensive, procedural manual routines in static work environments, helping to reduce workloads and increase the ease of work (36, 37). Given the current tendency of Chinese manufacturing enterprises to use AI to replace certain heavy and mechanical tasks, AI mainly helps enhance the flexibility and safety of the work environment and the ease of completing certain tasks. As working environments improve, the mental health and wellbeing of workers are also positively affected. Accordingly, we propose Hypothesis 3: The use of AI improves the work environment, which in turn benefits the mental health of workers.

DATA, VARIABLES AND MODELS
Data Source and Data Processing
The data used in this paper are derived from the 2018 CLDS, which was organized and implemented by the Social Science Research Center of Sun Yat-sen University. This survey uses a multistage, multilevel and labor-scale probability proportional to size sampling method. The target population is members of the workforce aged 15 to 64 from 29 provinces, municipalities, and autonomous regions nationwide (Hong Kong, Macao, Taiwan, Tibet, and Hainan are excluded). The survey focuses on the status of and changes in individual workers, families and communities.

A total of 4,770 individuals, 4,761 families, and 133 communities were involved in the survey, which indicates good representation. In addition, the individual survey in the 2018 CLDS includes a questionnaire specifically focused on information about the individual worker and the use of AI by work units, which is in line with the objectives of this study. The CLDS surveyed 2,547 corporate workers, of whom 1,040, or 33%, were manufacturing workers. Therefore, the empirical data used in this paper come only from the individual questionnaire in the 2018 CLDS.

The sample selection process in this study is as follows: On the basis of our research objectives, we focus on the situations of workers in manufacturing enterprises. The size of the sample of manufacturing workers is 838, including 801 workers under the age of 60. A sample of manufacturing workers aged 16–60 is selected for analysis. Due to a lack of information about unions in the sample, there are 227 observations with missing values. Therefore, the final analysis sample includes 550 valid observations. In addition, the effective sample size used in the robustness tests varies slightly.

Variable Descriptions
The dependent variable is the mental health status of the manufacturing workers. Depression is an important indicator of mental health status and has often been used in the literature to measure mental health status. In the CLDS questionnaire, respondents were asked to report the frequency with which they experienced 20 different symptoms of depression over the past week. The response options were "never or basically never (<1 day), rarely (1–2 days), often (3–4 days), almost always (5–7 days)," and these responses were assigned values of 0, 1, 2, and 3 points, respectively. A score was calculated for each of the 20 depressive symptoms, and the total score for each respondent was calculated as a proxy indicator for mental health. For this indicator, a higher score implies worse mental health, while a lower score implies that the respondent's mental health is relatively good.

The core independent variable is AI, which originates from a question "Does your employer use technologies such as highly automated processes, robots, or AI (e.g., driverless cars, machine translation, industrial robots, etc.)" in the CLDS questionnaire. If the answer is yes, this variable is assigned a value of 1. If the answer is no, it is assigned a value of 0.

The mediating variables are overtime and the work environment. We use answers to the question "Do you work overtime under normal circumstances?" as the basis for defining the overtime variable. The variable is set to 1 if the answer is yes and set to 0 if it is no. The work environment variable measures workers' evaluations of their satisfaction with their work environment. We use five options, namely, very dissatisfied, not quite satisfied, neither satisfied nor dissatisfied, relatively satisfied, and very satisfied, with the options assigned values of 1, 2, 3, 4, and 5, respectively. The higher the value of this index is, the better the work environment is.

In addition, to prevent other important variables affecting workers' mental health from being missed, in this paper, three categories of control variables are included: individual worker characteristics, employment characteristics, and social

capital. First, individual worker characteristics include gender, age, marital status, hukou status, years of education, and physical health, among other variables. Second, employment characteristics include employer type, annual income and labor union status. Third, social capital measures the number of acquaintances and neighborhood support. In addition, given that work-related mental health is affected by regional economic development, regional characteristics are also controlled for. The meanings of each variable and corresponding descriptive statistics are presented in **Table 1**.

Table 1 shows that the rate of use of AI in the manufacturing industry was 26% in 2018. In other words, AI was used in more than a quarter of all manufacturing companies. This shows that the integration of intelligent technology into the manufacturing industry has begun to be more common, but manufacturing enterprises have blindly adopted AI, and the percentage of firms using AI is still low. The satisfaction of workers with their work environment was relatively high, with an average evaluation score of 3.381, indicating that current work environments are relatively good. The mean and the standard deviation of the mental health variable are 7.286 and 9.043, respectively, indicating that workers have relatively good mental health but that there is wide variation. Male workers account for 53.7% of the sample, and the average age is 39.21 years old. Furthermore, married workers account for 86.3% of the sample, and workers with a nonagricultural hukou account for 31.3%. In addition, the average number of years of education is 10.33, and physical health scores were as high as 3.835. Most of the workers worked in private enterprises, foreign-funded enterprises, joint-venture enterprises, or other enterprises, and only 8.9% worked in state owned or collective enterprises. Most manufacturing enterprises (78.2%) are located in the eastern region. Across the whole sample, 31% of workers were involved in labor unions. Workers have moderate levels of social capital; that is, their number of acquaintances ranges from 1 to 16, and the frequency with which mutual assistance is provided within their neighborhoods is moderate.

Strategy for Model Setting and Analysis

This paper aims to explore the impact of the trend toward AI adoption in the manufacturing industry on the mental health of workers. And to clarify the role of overtime and the work environment in mediating the impact of AI on mental health. To this end, the empirical model is established as follows:

$$Psyhealth_i = \alpha_0 + \beta_0 AI_i + \gamma_0 control_i + \varepsilon_i \text{ (Formula 1)}$$
$$Overtime_i = \alpha_1 + \beta_1 AI_i + \gamma_1 control_i + \varepsilon_i \text{ (Formula 2)}$$
$$Psyhealth_i = \alpha_2 + \beta_2 AI_i + \delta_1 Overtime_i + \gamma_2 control_i + \varepsilon_i$$
(Formula 3)
$$Environment_i = \alpha_3 + \beta_3 AI_i + \gamma_2 control_i + \varepsilon_i \text{ (Formula 4)}$$
$$Psyhealth_i = \alpha_4 + \beta_4 AI_i + \delta_2 Environment_i + \gamma_3 control_i + \varepsilon_i$$
(Formula 5)

Formula 1 is used to test for the effect of AI on the mental health of manufacturing workers, that is, to examine hypothesis 1. Formula 2 and formula 3 are used to analyze the mediating role of overtime work in the effect of AI on the mental

TABLE 1 | Variable implications and descriptive statistics.

Variable name	Variable meaning	Mean	Standard error	N
Dependent variable				
Mental health	The total scores of 20 depressive symptoms	7.286	9.043	801
Core independent variable				
AI	Unused = 0, used = 1	0.260	0.439	800
Mediating variable				
Work overtime	Without overtime = 0, overtime = 1	0.405	0.491	691
Work environment	Work environment satisfaction: very dissatisfied = 1, not quite satisfied = 2, neither satisfied nor dissatisfied = 3, relatively satisfied = 4, very satisfied = 5	3.381	0.787	800
Controlled variables				
Gender	Female = 0, male = 1	0.537	0.499	801
Age	Unit: year	39.210	10.090	801
Marital status	Unmarried = 0, married = 1	0.863	0.344	801
Hukou status	Agricultural hukou = 0, non-agricultural hukou = 1	0.313	0.464	800
Years of education	Deprived of education = 0, primary school/private school = 6, middle school = 9, high school (ordinary high school, vocational high school, technical school, technical secondary school) = 12, junior college = 15, undergraduate degree = 16, master or above = 19	10.330	3.319	801
Physical health	Very unhealthy = 1, not quite unhealthy = 2, neither healthy nor unhealthy = 3, relatively healthy = 4, very healthy = 5	3.835	0.817	801
Employer type	State-owned enterprises or collective enterprises = 1, private enterprises (private enterprises, private enterprises, foreign investment, joint ventures, etc.) = 0	0.089	0.284	801
Annual income	Post-tax wage income in 2017, take the logarithm	9.531	3.367	777
Labor union	No union = 0, with the union =1	0.310	0.463	574
The Number of acquaintances	No acquaintance = 1, 1–16 acquaintances = 2, more than 17 acquaintances = 3	1.970	0.509	794
Neighborhood support	Very little = 1, less = 2, generally = 3, more = 4, a great many = 5	3.162	0.985	801
Regional characteristics	Eastern region = 1, Non-Eastern region = 0	0.782	0.413	801

health of manufacturing workers, that is, to examine Hypothesis 2. In addition, formula 4 and formula 5 are used to test whether the work environment mediates the effect of AI on the mental health of manufacturing workers, that is, to test Hypothesis 3. In the formulas, the subscript i indicates individual workers and $Psyhealth_i$ indicates worker i's mental health. In addition, $Overtime_i$ represents the overtime practices of worker i. $Environment_i$ indicates worker i's satisfaction with his or her work environment, and AI_i is a dummy variable that indicates whether the enterprise where worker i is employed uses AI technology. Moreover, $control_i$ represents the control variable matrix, which includes variables related to individual characteristics, employment characteristics and social capital. Finally, α_0, α_1, α_2, α_3 and α_4 are intercept items, and ε_i is a random disturbance.

To test the mediation effect, the traditional stepwise method and the popular bootstrap method are employed in this paper. The stepwise method is used to test the significance of the two groups, one group is β_0, β_1 and δ_1, the other group is β_0, β_3, δ_2. If β_0 is significant, then β_1 and δ_1 should be significant, which would suggest that the mediation effect is significant and that overtime work is a partial mediator. If β_0 is not significant, then β_1 and δ_1 should not be significant, which would imply that overtime work is a full mediator. Similarly, the mediation effect of work environment is the same with the derivation process. However, the power of the stepwise method in terms of testing for mediation effects is still controversial. This is why we use the bootstrap method to strengthen our test for mediation effects. N bootstrapped samples are obtained by repeatedly drawing observations from the sample N times, testing the significance of the product of the coefficients, namely, β_1 δ_1 and β_3 δ_2, in the N bootstrapped samples and splitting the mediation effect into indirect and direct effects. Moreover, to further improve the test's power, the 95% confidence intervals are constructed by using bias correction and acceleration methods. If the confidence intervals do not contain 0, then the results are significant and there is a mediation effect. If the confidence interval for neither the indirect effect nor the direct effect contains 0, the mediation effect is a partial mediation effect. If the confidence interval for the direct effect contains 0, the mediation effect is a full mediation effect.

RESULTS

The Overall Effect of AI on the Mental Health of Manufacturing Workers

Model 1 in **Table 2** reports the overall effect of AI on the mental health of manufacturing workers. After controlling for individual worker characteristics, employment characteristics and social capital, the regression coefficient for AI is −1.643, a result that is significant at the 5% level. This suggests that the use of AI can effectively reduce the psychological depression scores of manufacturing workers, thereby promoting better mental health among workers. Hypothesis 1 is accepted.

In addition, the regression results for Model 1 convey the following information. First, compared with female workers, male workers had significantly lower psychological

TABLE 2 | The impact of AI on the mental health of manufacturing workers: overall and mediating effects.

Variables	Mental health	Work overtime	Mental health
	Model 1	Model 2	Model 3
AI	−1.643** (0.758)	0.894*** (0.215)	−1.816** (0.774)
Work overtime			0.845 (0.794)
Gender	−1.312* (0.760)	0.359* (0.193)	−1.379* (0.762)
Age	−0.065 (0.044)	−0.027** (0.011)	−0.060 (0.044)
Marital status	−1.760 (1.404)	0.578* (0.320)	−1.866 (1.422)
Hukou status	0.259 (0.888)	−0.341 (0.228)	0.322 (0.892)
Years of education	−0.073 (0.143)	−0.040 (0.033)	−0.066 (0.143)
Physical health	−2.578*** (0.496)	−0.140 (0.118)	−2.553*** (0.495)
Employer type	0.057 (1.284)	−0.272 (0.348)	0.104 (1.284)
Annual income	−0.036 (0.154)	−0.018 (0.033)	−0.032 (0.156)
Labor union	0.659 (0.878)	0.326 (0.220)	0.600 (0.878)
The number of acquaintances	−1.331* (0.767)	0.197 (0.192)	−1.368* (0.769)
Neighborhood support	−0.011 (0.390)	−0.362*** (0.098)	0.057 (0.408)
Regional characteristics	−0.653 (1.021)	0.335 (0.242)	−0.714 (1.026)
Constant	26.524*** (4.198)	1.341 (0.848)	25.855*** (4.249)
Observations	550	550	550

*$p < 0.1$, **$p < 0.05$, ***$p < 0.01$.

depression scores by 1.312 points. That is, male workers have relatively good mental health. Second, the positive effect of the physical health of the manufacturing workers on their mental health is relatively large. For each unit of improvement in the physical health of the manufacturing workers, the depression score decreases by 2.578 points. This is much greater than the effect of AI on the mental health of manufacturing workers. Third, the more acquaintances the manufacturing workers have, the lower their psychological depression scores are. That is, the better their mental health is. This suggests that among workers, social capital is conducive to alleviating psychological depression and promoting psychological wellbeing.

Mediating Effect of Overtime Work on the Mental Health of Manufacturing Workers

Model 1, Model 2, and Model 3 in **Table 2** show the step-by-step estimation of the mediating effect of overtime work. The results of Model 1 show that AI can help reduce the psychological depression scores of manufacturing workers and improve their

mental health. The results of Model 2 show that there is a positive correlation between AI and overtime. The use of AI does not reduce the likelihood of working overtime; on the contrary, the probability of working overtime. This result lends support to the idea that companies are more likely to adopt AI as a result of difficulties in recruiting. In addition, at this stage, AI is used on a limited scale due to its high input costs. Moreover, the integration of the Chinese manufacturing industry and AI is only just beginning. Therefore, the Chinese manufacturing industry is currently more likely to use AI and require corporate employees to work overtime. The results of Model 3 show that the positive impact of AI on mental health is still significant, while overtime has no significant impact on the mental health of manufacturing workers. This shows that working overtime does not mediate the relationship between AI and the mental health of manufacturing workers. Hypothesis 2 is not supported by the data.

Mediating Effect of the Work Environment on the Mental Health of Manufacturing Workers

Given the empirical results in **Table 2**, working overtime has no significant effect on mental health. Therefore, when estimating the mediating effect of the work environment on the mental health of manufacturing workers, overtime work is included as an employment characteristic control variable. In **Table 3**, Models 4, 5 and 6 present the empirical results of the stepwise test of the mediating effects of the work environment. Model 4 tests the overall effect of AI on the mental health of manufacturing workers. No further elaboration is needed. Model 5 reports the effect of AI on the work environment. Model 6 reports the effect of AI and the work environment on the psychological wellbeing of manufacturing workers. In Model 5, the regression coefficient for the effect of AI on the work environment is significantly positive. This indicates that the use of AI significantly improves the satisfaction of manufacturing workers with their work environment and promotes an improved work environment in the manufacturing industry. In the results of Model 6, the regression coefficients for the effects of AI and the work environment on the psychological health of manufacturing workers are significant. Combined with the significant regression coefficient on AI in Model 4, these results imply that the work environment acts as a mediator between AI and the psychological health of manufacturing workers. Hypothesis 3 is confirmed. The trend of intelligent technology use in the manufacturing industry improves the psychological health of manufacturing workers by promoting an improved work environment.

To enhance the power of the stepwise analysis, the bootstrap method is also employed in this paper to test for mediation effects. A total of 1,000 manufacturing worker samples were drawn, and the results tested by using the bias-corrected and accelerated (Bca) 95% confidence intervals.

The results show that the Bca 95% confidence interval for overtime work includes 0, indicating that overtime is not a mediator. The Bca 95% confidence interval for the work environment does not contain 0: the mediating effect of the work

TABLE 3 | The impact of AI on the mental health of manufacturing workers: overall and mediating effects.

Variables	Mental health	Work environment	Mental health
	Model 4	Model 5	Model 6
AI	−1.816** (0.774)	0.157* (0.080)	−1.607** (0.765)
Work environment			−1.332*** (0.509)
Gender	−1.379* (0.762)	−0.162** (0.067)	−1.595** (0.772)
Age	−0.060 (0.044)	0.002 (0.004)	−0.057 (0.043)
Marital Status	−1.866 (1.422)	0.063 (0.111)	−1.782 (1.399)
Hukou status	0.322 (0.892)	0.180** (0.083)	0.561 (0.892)
Years of education	−0.066 (0.143)	0.014 (0.012)	−0.048 (0.141)
Physical health	−2.553*** (0.495)	0.176*** (0.046)	−2.318*** (0.472)
Employer type	0.104 (1.284)	−0.374*** (0.124)	−0.394 (1.298)
Annual income	−0.032 (0.156)	−0.015 (0.012)	−0.052 (0.153)
Labor union	0.600 (0.878)	0.040 (0.079)	0.652 (0.879)
Work overtime	0.845 (0.794)	−0.118 (0.072)	0.688 (0.790)
The number of acquaintances	−1.368* (0.769)	0.040 (0.071)	−1.315* (0.762)
Neighborhood support	0.057 (0.408)	−0.016 (0.035)	0.036 (0.405)
Regional characteristics	−0.714 (1.026)	0.086 (0.097)	−0.600 (1.005)
Constant	25.855*** (4.249)	2.530*** (0.324)	29.224*** (4.739)
Observations	550	550	550

*$p < 0.1$, **$p < 0.05$, ***$p < 0.01$.

environment remains significant (the confidence intervals for neither the indirect nor the direct effect contained 0). The work environment explains 11.509% of the psychological wellbeing of manufacturing workers.

Robustness Test

To ensure the reliability of the above findings, two robustness tests are conducted (see **Table 4** for the test results). The previous empirical results show that overtime work does not exhibit any mediating effects. Therefore, in this section, only the robustness of the main effect of AI and the mediating effect of the work environment are tested.

First, the robustness of the overall effect is tested by using an alternative measurement for the dependent variable. In the previous section, workers' psychological wellbeing was measured as the sum of the scores for 20 depressive symptoms. Here, drawing on the existing literature, a cutoff of 16 points is used to construct an indicator for worker tendencies toward psychological depression as a proxy variable for mental health.

TABLE 4 | The impact of AI on the mental health of manufacturing workers: a robustness tests.

Variables	Psychological depression	Overall work environment	Mental health
	Model 7	Model 8	Model 9
AI	−0.531* (0.282)	0.536* (0.278)	−1.527** (0.766)
Work overtime		−1.033*** (0.2)	0.381 (0.818)
Overall work environment			−0.442*** (0.142)
Gender	−0.261 (0.232)	−0.411* (0.239)	−1.605** (0.761)
Age	−0.016 (0.014)	0.010 (0.015)	−0.056 (0.043)
Marital status	−0.540 (0.355)	0.417 (0.403)	−1.704 (1.399)
Hukou status	0.193 (0.273)	0.476 (0.306)	0.443 (0.889)
Years of education	−0.016 (0.040)	0.033 (0.043)	−0.052 (0.139)
Physical health	−0.466*** (0.142)	0.833*** (0.158)	−2.173*** (0.475)
Employer type	−0.348 (0.442)	−0.815* (0.449)	−0.193 (1.278)
Annual income	−0.007 (0.038)	−0.039 (0.049)	−0.050 (0.151)
Labor union	0.206 (0.270)	0.256 (0.274)	0.733 (0.881)
The number of acquaintances	−0.491** (0.241)	0.193 (0.251)	−1.210 (0.758)
Neighborhood support	0.137 (0.119)	0.073 (0.133)	0.073 (0.398)
Regional characteristics	0.063 (0.288)	0.504 (0.319)	−0.525 (1.005)
Constant	2.286** (1.022)	12.111*** (1.180)	31.139*** (4.959)
Observations	547	547	547

*$p < 0.1$, **$p < 0.05$, ***$p < 0.01$.

TABLE 5 | The impact of work environment on the psychological well-being of manufacturing workers: a test of mediating effects based on the Bootstrap method.

Mediators		Coeff	Boot SE	95% CI(Bca)	Change, %
Work overtime	Indirect effect	0.173	0.175	[−0.104, 0.592]	—
	Direct effect	−1.816	0.810	[−3.389, −0.207]	
Work environment	Indirect effect	−0.209	0.136	[−0.642, −0.016]	11.509
	Direct effect	−1.607	0.805	[−3.202, −0.039]	
Overall work environment	Indirect effect	−0.237	0.150	[−0.604, −0.014]	13.435
	Direct effect	−1.527	0.763	[−3.178, −0.038]	

If a worker's total depressive symptom score is strictly <16, then his or her mental health status is considered good, and a value of 0 is assigned to the variable. Conversely, if the total score is 16 or greater, it indicates poor mental health, and a value of 1 is assigned. The regression results are obtained by substituting this new variable into formula 1 and are presented as Model 7. The results are highly consistent with those of Model 1, with the regression coefficient for AI remaining negative and significant. This suggests that AI does help reduce manufacturing workers' tendency toward psychological depression and enhances workers' mental health.

Second, the robustness of the mediating effect was tested by using a new measurement for the mediating variable. Whereas in the previous section, only a single-dimensional measure of the work environment was used, here, a five-dimensional measure is used. The five dimensions include job income, job security, work environment, working hours and overall job satisfaction. The sum of the satisfaction scores for the five dimensions is used as a proxy for the work environment. The larger the indicator is, the better the overall work environment. The stepwise approach

(Model 7 to Model 8) and bootstrap method are used to test for the mediating effects of this indicator (third row of **Table 5**). The results show that the effects of AI and of the overall work environment on the mental health of manufacturing workers are still significant, and the Bca 95% confidence interval does not contain 0. The work environment is a robust mediator of the relationship between AI and manufacturing workers' psychological wellbeing.

FURTHER DISCUSSION: HETEROGENEITY ANALYSIS

The impact of AI on workers' mental health has been found to vary with differences in workers' endowments. For this reason, this study continues to explore the heterogeneity in the effects of AI on the mental health of manufacturing workers along two dimensions: skill levels and generational membership. These two dimensions are chosen for the following reasons. First, at the beginning of the intelligentization of manufacturing, AI is usually

used to replace routine, simple, and low-skilled work (38). It is usually low-skilled workers who are employed in this type of work. This means that low-skilled workers are exposed to AI earlier than high-skilled workers. Moreover, with the deepening of the integration of AI into manufacturing, manufacturing enterprises increasingly need workers with advanced digital skills but have a reduced demand for low-skilled workers (39). Therefore, the impact of AI in manufacturing on workers' mental health is also expected to vary by skill level. Second, unlike workers born before 1980, workers born after 1980 were born after the reform and opening up, and they are relatively better able to learn and accept new technologies such as AI. Therefore, should we also expect there to be generational differences in the impact of AI on the mental health of manufacturing workers?

Heterogeneity in the Impact of AI on the Mental Health of Manufacturing Workers With Different Skill Levels

In this paper, workers are categorized according to their level of education into those with a middle school education or lower and those with a high school education or higher as a way of distinguishing between low-skilled and high-skilled manufacturing workers. **Table 6** reports the heterogeneity in the impact of AI on the mental health of manufacturing workers with different skill levels. The results show that the impact of AI on the mental health of manufacturing workers varies significantly with skill levels. Specifically, AI significantly improves the mental health of low-skilled manufacturing workers but not that of high-skilled manufacturing workers. Notably, the coefficient for the effect of AI on the mental health of low-skilled manufacturing workers is 2.342, a positive effect much higher than that estimated for the full sample, and this result is significant at the 5% level.

There are several possible reasons for this finding. First, while AI replaces specific tasks completed by low-skilled workers that are often dull, dangerous, dirty, etc., this does not mean that low-skilled workers are willing to do such jobs. On the contrary, the use of AI frees low-skilled workers from these jobs, giving them time to do what they are willing to do and promoting their mental health. Second, as high-skilled workers are usually engaged in more knowledge-based work, AI acts as more of a support for them. This means that AI is relatively less helpful to high-skilled workers, and thus, the mental health of high-skilled workers does not fluctuate significantly. Third, as AI in China is currently mainly used for dull, dangerous, and dirty tasks and other tasks usually completed by low-skilled workers, there is thus a greater gain in mental health among low-skilled workers than among manufacturing workers as a whole.

Heterogeneity in the Impact of AI on the Mental Health of Manufacturing Workers Across Generations

In this paper, 1980 is used as the generational cutoff for manufacturing workers, with those born in 1979 or before being referred to as pre-1980's workers and those born in 1980 or after being referred to as post-1980's workers. **Table 7** reports the heterogeneity in the impact of AI on the mental health of

TABLE 6 | Heterogeneity in the impact of AI on the mental health of manufacturing workers: low-skilled versus high-skilled.

Variables	Low-skilled	High-skilled
	Model 10	**Model 11**
AI	−2.342** (1.036)	−0.873 (1.226)
Controlled variable	Controlled	Controlled
Constant	24.775*** (5.767)	29.458*** (7.932)
Observations	308	242

*$p < 0.1$, **$p < 0.05$, ***$p < 0.01$.
The control variables are the same as in Model 1. The focus is on skill heterogeneity in the impact of AI on the mental health of manufacturing workers. Regression results for control variables are not presented in detail for brevity.

TABLE 7 | Heterogeneity in the impact of AI on the mental health of manufacturing workers: pre-1980's vs. post-1980's.

Variables	pre-1980's	post-1980's
	Model 12	**Model 13**
AI	−2.070* (1.079)	−1.414 (1.076)
Controlled variable	Controlled	Controlled
Constant	14.019** (5.873)	30.419*** (7.385)
Observations	287	263

*$p < 0.1$, **$p < 0.05$, ***$p < 0.01$.
The control variables are the same as in Model 1. The focus is on skill heterogeneity in the impact of AI on the mental health of manufacturing workers. Regression results for control variables are not presented in detail for brevity.

manufacturing workers across different generations. The results show that there is a significant generational effect. Specifically, when AI is used in the manufacturing industry, the mental health scores of the pre-1980's manufacturing workers increases by 2.070 points, a result that is significant at the 10% level. However, there is no clear positive effect of AI on the psychological wellbeing of post-1980's manufacturing workers. This suggests that AI helped to promote the mental health of only the pre-1980's manufacturing workers.

There are two possible reasons for this result. First, compared with the post-1980's workers, the pre-1980's workers are harder working and more willing to do dirty, hard and tiring work to earn an income. When AI takes on such work, the workloads of the pre-1980's workers are eased, and their mental health is improved. Second, unlike the post-1980's workers, the pre-1980's workers are past their career peak and are about to exit the labor market. For these workers, work is not their only priority, and family happiness becomes their main pursuit. The use of AI increases the flexibility in their working hours, allowing them to spend more time with their families and receive greater moral support from them, thus improving their mental health.

CONCLUSIONS AND SUGGESTIONS

Conclusions

Using data from the 2018 CLDS, we examine the impact of AI and the mediating effect of the overtime and work environment on the mental health of manufacturing workers. We further

analyze the heterogeneity in the effects of AI on the mental health of manufacturing workers by skill level and generation. In conclusion, AI has an obvious positive effect on the mental health of manufacturing workers. There is a positive relationship between AI and overtime work but no mediating effect between overtime work and manufacturing workers' mental health. This study also confirms that AI improves the work environments of manufacturing workers and thus indirectly promotes their mental health. The quality of the working environment mediates the impact of AI on the mental health of manufacturing workers. This study still emphasizes that the contribution of AI to the mental health of manufacturing workers varies by skill level and generation. AI can contribute significantly to improvements in the mental health of low-skilled manufacturing workers and those workers born before 1980 and has a greater positive impact on low-skilled workers.

This study had three main limitations. First, this study is limited by the use of cross-sectional data. Although the CLDS is data longitudinal survey, only the 2018 wave contains information that applies to this research topic, as the AI questions were first asked in 2018. The cross-sectional nature of the data makes it difficult to conduct an in-depth examination of the mechanisms underlying the impact of the working environment on the mental health of manufacturing workers. We will continue to focus on related AI data in the future in an effort to develop a panel dataset to subsequently advance such research. Second, this study is constrained by the available data measurements. In reality, the path by which AI impacts the mental health of manufacturing workers is highly complex. AI does not affect mental health through only one pathway, such as the working environment, which was studied in this paper. AI may affect the mental health of manufacturing workers through opportunities for promotion, social status, and work–family balance, among other pathways. More data and information are still needed to answer this question. Third, this study is limited by the survey structure. Since the unemployed do not answer the question "Does your employer use technologies such as highly automated processes, robots, or AI (e.g., driverless cars, machine translation, industrial robots, etc.)?," it is difficult to estimate the mental health status of those who have lost their jobs due to AI. It is only possible to observe the impact of AI on the mental health of those currently working in manufacturing.

This study contributes a micro perspective for understanding the development dividends received by workers as AI and manufacturing become deeply integrated. Through this integration, people have a greater sense of gain from sharing in the achievements of intelligent manufacturing, which is reflected in their subjective psychological wellbeing. The impact of AI on the workforce is not only reflected in objective measures of economic wellbeing, such as the distribution of employment income but should also ultimately affect the subjective psychological wellbeing of workers. The key to this process is the improvement of the work environment through the use of AI, which in turn enhances the mental health of manufacturing workers. Currently, intelligent technology in China's manufacturing industry has mainly replaced work in unfavorable environments. Low-skilled workers and workers

born before 1980 are more likely to work in poor work environments, such as those of dull, dirty and dangerous jobs. Therefore, in the initial stages of the development of intelligent technology in the Chinese manufacturing industry, the mental health of workers is significantly higher, and low-skilled and pre-1980's workers derive greater mental health benefits from AI. Relatively speaking, highly skilled workers and workers born after 1980 have yet to enjoy the psychological benefits of AI. The impact of AI on the mental wellbeing of manufacturing workers exhibits poverty spillover effects.

Suggestions

With the trend toward the deep integration of AI and manufacturing, the question of how to protect workers' mental health, reduce psychological injuries, and encourage workers to share in the dividends of AI development is still worth considering. This paper makes the following two suggestions.

First, AI should be continually utilized to improve the work environments within the manufacturing industry in order to enhance the mental health and wellbeing of workers. The positive role of AI in improving the manufacturing work environment should be amplified. Work that workers are unable or unwilling to perform and that is conducted in unfavorable working environments should be handed over to AI to alleviate negative emotions about work and improve workers' mental health. Currently, manufacturing companies, constrained by both investment capital and industrial data, mainly use AI to replace dull, dirty and dangerous jobs in order to cope with the cost pressures arising from recruitment difficulties and expensive labor. However, it is important to note that the fundamental motivation behind the adoption of AI is to improve productivity through technological adjustments and that reducing labor costs is only a secondary consideration. As manufacturing enterprises become better able to control AI, these two constraints will gradually be relaxed. Manufacturers will eventually apply AI to other areas to improve production efficiency, and workplace improvements will no longer be a priority. As a result, companies should use AI cautiously in order to sustain its positive role in improving the work environment, and they should use AI to perform repetitive, fatiguing and dangerous tasks in order to reduce the negative impacts of AI expanding into other areas, which could endanger workers' mental health.

Second, it should be noted that there is a need to develop and design new AI to improve the mental health of highly skilled, post-1980's workers and to expand the benefits of AI for the psychological wellbeing of the workforce as a whole. This paper found no significant impact of AI on the mental health of highly skilled workers or those born after 1980. This is not promising. The number of highly skilled workers is gradually increasing as the average number of years of education increases. In addition, generational turnover in the workforce has made post-1980's workers the largest share of the labor force. This means that AI does not have a clearly positive impact on the mental health of the future workforce. Thus, it is necessary to focus on stimulating the positive impact of AI on the mental health of highly skilled and post-1980's workers. AI must not be used only to complete dull, dirty

and dangerous jobs but also to support highly skilled and post-1980's workers. Taking into account their psychological needs, new AI should be developed and designed to reduce their workloads and contribute to their physical and mental wellbeing, thereby expanding the psychological benefits of AI to the entire workforce.

DATA AVAILABILITY STATEMENT

The data analyzed in this study is subject to the following licenses/restrictions: The 2018 CLDS data needs to wait until it is disclosed to all academic colleagues, and apply for real-name registration on the website of the Center for Social Science Survey at Sun Yat-sen University in Guangzhou, China. After approval, it can be downloaded and used for free. Requests to access these datasets should be directed to https://sysu.pagaloo.com/d/edu.cn/css.

AUTHOR CONTRIBUTIONS

LL has sorted out relevant literature on the impact of artificial intelligence and work environment on workers' mental health, designed empirical models and analysis strategies, and participated in data cleaning, empirical results interpretation, and draft writing. WW designed the study, provided instructive comments unremittingly, and participated in manuscript revisions. Both authors contributed to the article and approved the submitted version.

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Occupational Burnout and Productivity Loss: A Cross-Sectional Study Among Academic University Staff

Shaimaa A. A. M. Amer[1], Sally Fawzy Elotla[1], Abeer Elsayed Ameen[1], Jaffer Shah[2]* and Ahmed Mahmoud Fouad[1]

[1] *Department of Public Health, Occupational and Environmental Medicine, Faculty of Medicine, Suez Canal University, Ismailia, Egypt, [2] Medical Research Center, Kateb University, Kabul, Afghanistan*

Background: Burnout has been endorsed with serious negative health- and work-related outcomes. This study is aimed to assess the prevalence of burnout and its association with work productivity among academic staff.

Methods: This cross-sectional study involved 240 academic staff working at a public university in Egypt. Participants were invited to complete a web-based questionnaire involving basic personal, health, and work-related characteristics. Besides, Maslach Burnout Inventory-Human Services Survey (MBI-HSS) was used to assess occupational burnout dimensions (i.e., emotional exhaustion "EE," depersonalization "DP," and personal accomplishment "PA"), while work productivity was assessed with the Health and Work Performance Questionnaire (HPQ).

Results: In total, 28% of respondents scored high in EE [95% confidence interval (CI): 22.5–33.8%], 18.3% high in DP (95% CI: 13.8–3.6%), and 88.3% scored low in PA (95% CI: 83.8–91.9%). Seventy percent of respondents scored high in only one burnout dimension, 21.7% scored high in two dimensions, while 7.1% scored high in all three dimensions. Multivariable analysis showed that EE was the only burnout dimension that showed a statistically significant association between absenteeism and presenteeism rates. The absenteeism rates among respondents with moderate and high EE were 2.1 and 3.3 times the rates among those with low EE, respectively. Likewise, the presenteeism rates among respondents with moderate and high EE were 2.4 and 4.7 times the rates among those with low EE, respectively.

Conclusions: Academic staff showed a high prevalence of at least one burnout dimension. Moderate and high EE scores were significantly associated with increased productivity loss when compared to low EE.

Keywords: productivity, burnout, academic staff, Egypt, emotional exhaustion, occupational

INTRODUCTION

The world health organization (WHO), in its latest revision of the International Classification of Diseases (ICD-11, 2019), has officially classified burnout as an occupational phenomenon that should not apply to describe experiences in other areas of life. Building on previous Maslach's work, burnout was defined in the WHO's ICD-11 as "a syndrome conceptualized as resulting from chronic workplace stress that has not been successfully managed and characterized by three dimensions: feelings of energy depletion or exhaustion; increased mental distance from one's job or feelings of negativism or cynicism related to one's job; and reduced professional efficacy" (1, 2).

Burnout has been addressed in various occupational settings, such as universities, with serious negative implications on job retention, commitment, satisfaction, and performance (3). Burnout among academic staff impairs not only their mental and physical health but also reduces their perceived self-efficacy and responsiveness to students' needs, leading to reduced effectiveness of the educational process and students' satisfaction (4–6).

Academic institutions have been recognized for the increasingly demanding work environments and high levels of stress that have significantly increased over the last few decades (7–10). Academic staff is strained by a variety of challenging and often conflicting roles, such as providing high-quality teaching and supervision to a growing number of students, publishing innovative research in high-impact journals, application of research grants, sustaining managerial and entrepreneurial skills, and tenure-related accomplishment (8, 9, 11). Coping with these complex work demands, increasing role-ambiguity and role-conflicts, job insecurity, and competitiveness, is very stressful and has been associated with the increased psychological strain, depletion of mental resources, and burnout among academic staff (7, 12, 13).

The burden of burnout among academic staff has recently received increasing attention because of the growing global changing in curricula design and technology. Digital transformation, expansion of teleworking, and dynamic multi-task duties have created further pressure on meeting the high-performance expectations in universities, particularly, in public universities (11, 14).

Egypt is currently seeking to improve its educational system's quality to conform to international systems along with its national strategy for sustainable development, Egypt vision 2030. With the expansion of the private universities in Egypt, competition between the higher education institutions became more severe. As a competitive advantage, faculty performance undergoes continuous assessment and monitoring by the human resources departments (15). Besides, as a requirement for their promotion, faculty members in Egypt are overwhelmed with scholar productivity, particularly, the international peer-reviewed publication, which is also required to increase the ranking of their universities. In addition, academic staff in Egypt has to be involved in community outreach programs and projects that emphasize the community needs, ambitions, and the market (16). The tenure track is the only professor's pathway

to the promotion and academic job security in all Egyptian public universities. Professor's contributions in three areas, i.e., research, teaching, and service to the university and community, undergo vigorous evaluation every at least 5 years. However, private universities have mixed systems that are mostly non-tenure track, which depends on temporary contracts renewed annually according to staff performance and resources.

Burnout has been identified as a disruptive factor in organizational performance and costs (17). Physical and mental health significantly moderate the relationship between work-related factors and individual work productivity (18). Loss of work productivity involves increased absenteeism, presenteeism, and reduced work ability (18, 19). Although work productivity has been widely studied in different physical and mental health conditions and disabilities (20–22), few studies have addressed the association with burnout.

Studying the productivity of academic staff in Egypt is necessary, given their role in Egypt's economic and social transformation as described in Egypt's strategy for sustainable development, Egypt vision 2030. Escalating their productivity is essential for their institutions' development and sustainability. Occupational stress and burnout are major challenges for the individual and institutional productivity and turnover, representing 12% of all absent workforce (23). Furthermore, increased productivity loss and turnover have many economic implications that could boost Egypt's struggle for the economic transformation and social welfare. Therefore, the purpose of this study was to assess the prevalence of burnout and its association with work productivity in a sample of academic staff in Egypt.

METHODS

This cross-sectional study involved academic staff who had worked for at least 6 months at Suez Canal University, Ismailia, Egypt (a public university in Egypt). We obtained ethical approval from the IRB of the faculty of medicine at xxx university. Further permissions to conduct this study were taken from the appropriate authorities at the faculties of art and social sciences, life sciences, and other sciences. The information technology and human resource departments were approached to get the email addresses of eligible staff. An invitation that includes information about the purpose and procedures of the study was emailed to a convenient sample of 240 academic staff across the faculties (proportionally stratified by the specialties: Art and Social Sciences, Life Sciences, and Other Sciences). The size of this sample (i.e., 240) was calculated using Epi-Info® StatCalc software, version 7.2.4.0 (Centers for Disease Control and Prevention, Atlanta, GA, USA), giving an expected percentage of 38.9% of participants who had a high burnout and decreased work productivity (24), 95% level of confidence, 6.5% absolute precision level, and the addition of a 10% of the calculated number to compensate for dropout.

In the emailed invitation, respondents were asked if they would give their consent to take part in this study. Respondents who gave their consent to take part in this study were asked to click a link for a web-based questionnaire. The

questionnaire included basic data about the socio-demographic characteristics (e.g., age, residence, marital status, and education); lifestyle behaviors (e.g., smoking, physical activity, and alcohol consumption); self-reported body weight and height; and work characteristics (e.g., job categories, duration of employment, and work patterns). Regular physical activity was defined according to the World Health Organization (WHO) as "at least 150–300 min of moderate-intensity aerobic physical activity; at least 75–150 min of vigorous-intensity aerobic physical activity; or an equivalent combination of moderate- and vigorous-intensity activity throughout the week $\geq$ 150 min/week" (25). Body mass index (BMI) was calculated as the body weight in kg divided by the squared root of the height in cm. BMI values $\geq$ 30 kg/m^2 denote obesity, while BMI values of 25–29.9 were overweight (26).

Maslach Burnout Inventory-Human Services Survey (MBI-HSS) was used to assess occupational burnout on three subscales: emotional exhaustion (EE) (9 items), depersonalization (DP) (5 items), and professional accomplishment (PA) (8 items), with a 7-point Likert scale (0 = never, 1 = a few times a year or less, 2 = once a month or less, 3 = a few times a month, 4 = once a week, 5 = a few times a week, and 6 = every day). High levels of EE and DP subscales and low levels of PA suggest burnout (27). The Arabic version of MBI-HSS was validated in many Arab populations (28–31) and authors have reported satisfactory psychometric properties of reliability and validity. The Arabic translation of MBI-HSS was adapted to the vernacular of Egyptian by a panel of experts who performed forward-backward translation according to the WHO guidelines for translation and validation of questionnaires. A pilot testing was performed following a minor revision of dialects. The internal consistency of the Arabic MBI-HSS in our sample was satisfactory, with Cronbach's alfa of 0.78, 0.81, and 0.72 for EE, DP, and PA, respectively.

This study made the use of the WHO's Health and Work Performance Questionnaire (HPQ) to assess work productivity among respondents. The Arabic translation of the HPQ was performed in an earlier work by the Fouad et al. (21) who translated it using forward-backward translation according to the WHO guidelines for translation and validation of questionnaires. In HPQ, the assessment of work productivity relies on measuring absenteeism and presenteeism in days through a series of self-administered questions as described by Kessler et al. (32).

Statistical Analysis

All data manipulation and statistical analyses were performed with SPSS Software version 25 (IBM Corporation, Armonk, NY, USA). Categorical variables were presented as frequencies and percentages (%) while continuous and discrete data were presented as mean ± standard deviation (SD). Normality of continuous data [e.g., burnout domains' scores (EE, DP, and PA), absenteeism, and presenteeism variables] was tested by the Kolmogorov-Smirnov test. The median and interquartile ranges were used to summarize variables, which were not normally distributed. Associations between categorical variables were tested for statistical analysis using a chi-square test or Fisher's exact test (if > 20% of expected values were <5).

Mann-Whitney and Kruskal-Wallis tests were used to test for the statistical significance of differences in no-normally distributed variables across the categories of other study variables. Spearman's correlation was used for testing the significance of bivariate associations.

Multivariable analyses were performed using negative binomial regression models because our dependent variables (i.e., absenteeism and presenteeism) were counted data with many zeros measured in a 28-day time frame and because of the over-dispersion of these variables in our sample. Rate ratios and their 95% confidence intervals (CIs) were reported for each model. Values of $p < 0.05$ was considered statistically significant.

RESULTS

This study involved 240 academic staff; 73% were women and 27% were men, with an average age of 42.5 (±7.9) years. A detailed description of the demographic, health, and work characteristics of the studied sample is summarized in **Table 1**. Twenty-eight percentage of respondents scored high for EE (95% CI: 22.5–33.8%), 18.3% scored high for DP (95% CI: 13.8–23.6%), while 88.3% scored low for PA (95% CI: 83.8–91.9%). Over two-thirds of respondents scored high for burnout in only one dimension (70.0%, 95% CI: 64.0–75.5%), 21.7% scored high for burnout in two dimensions (95% CI: 16.8–27.2%), and 7.1% scored high for burnout in all three dimensions (95% CI: 14.3–10.9%). Only three respondents (1.3%, 95% CI: 0.4–3.3%) did not score high for burnout in any dimension.

Table 1 shows the distribution of respondents' scores in the different burnout dimensions by their demographic, health, and work characteristics. Women, remote residence, life science specialties, and increasing telework hours per week were significantly associated with higher median scores for burnout in the EE dimension. Increased number of workdays and telework hours per week were significantly associated with higher median scores for burnout in the DP dimension. Life science specialties were associated with lower median score for burnout in PA dimension, while increasing the number of workdays and telework hours per week was associated with higher median scores for PA.

During the last 28 days, respondents reported average absenteeism days of 1 day (range: 0–4 days) and average presenteeism days of 2.7 days (range: 0–9.3 days). **Table 2** shows the distribution of respondents' median absenteeism and presenteeism days by their demographic, health, and work characteristics. Absenteeism was significantly associated with only the professional specialties; respondents from life sciences specialties showed significantly higher median absenteeism days than other specialties. Presenteeism was significantly associated with respondents' residence, professional specialties, workdays per week, and telework hours per week. The median presenteeism days were significantly high among respondents who were living in remote governorates and working in life sciences specialties. The number of workdays per week and telework hours per week showed significant positive, but weak, correlation with the number of presenteeism days.

TABLE 1 | Distribution of respondents' burnout scores by their demographic, health, and work characteristics (N = 240).

Characteristics	n (%)	Occupational burnout domains, median (IQR)					
		EE	p-value	DP	p-value	PA	p-value
Age, years	89 (37.1%)	23.0 (15.0, 30.0)	0.11	11.0 (9.0, 12.0)	0.098	26.0 (21.0, 29.0)	0.576
<40							
40–49	104 (43.3%)	21.0 (13.5, 29.0)		11.0 (8.0, 13.0)		26.0 (20.0, 29.0)	
50 or older	47 (19.6%)	17.0 (12.0, 25.0)		10.0 (7.0, 12.0)		25.0 (21.0, 29.0)	
Gender							
Male	175 (72.9%)	18.0 (13.0, 28.0)	**0.005***	11.0 (8.0, 12.0)	0.668	27.0 (21.0, 29.0)	0.164
Female	65 (27.1%)	24.0 (18.0, 30.0)		11.0 (8.0, 12.0)		24.0 (18.0, 30.0)	
Residence							
The same governorate	197 (82.1%)	18.0 (13.0, 26.0)	**0.001***	11.0 (8.0, 12.0)	0.272	26.0 (21.0, 29.0)	0.309
Remote governorate	43 (17.9%)	25.0 (20.0, 33.0)		11.0 (8.0, 13.0)		24.0 (17.0, 28.0)	
Marital status							
Single	11 (4.6%)	31.0 (19.0, 34.0)	0.054	12.0 (10.0, 14.0)	0.287	22.0 (20.0, 30.0)	0.46
Married	214 (89.2%)	20.0 (13.0, 29.0)		11.0 (8.0, 12.0)		26.0 (21.0, 29.0)	
Divorced or widowed	15 (6.3%)	18.0 (13.0, 23.0)		10.0 (8.0, 12.0)		27.0 (24.0, 30.0)	
Number of offspring							
None	33 (13.8%)	21.0 (16.0, 31.0)	0.283	12.0 (10.0, 12.0)	0.155	28.0 (22.0, 30.0)	0.23
1–2	64 (26.7%)	23.0 (12.0, 30.0)		11.0 (8.5, 12.0)		26.0 (20.0, 29.0)	
3 or more	143 (59.6%)	19.0 (14.0, 28.0)		11.0 (8.0, 12.0)		26.0 (21.0, 29.0)	
Age of youngest offspring (n = 207)							
<5	85 (41.1%)	21.0 (13.0, 29.0)	0.852	11.0 (8.0, 12.0)	0.976	25.0 (19.5, 29.0)	0.46
5–17	106 (51.2%)	20.5 (15.0, 27.0)		11.0 (8.0, 12.0)		25.0 (20.0, 29.0)	
18+	16 (7.7%)	18.0 (12.0, 30.0)		11.0 (8.0, 12.0)		27.0 (21.0, 29.0)	
Body mass index class							
Normal	42 (17.6%)	21.0 (13.0, 30.0)	0.633	11.5 (9.0, 12.0)	0.751	26.5 (22.0, 30.0)	0.542
Overweight	110 (46.0%)	19.0 (14.0, 26.0)		11.0 (8.0, 12.0)		25.0 (21.0, 29.0)	
Obese	87 (36.4%)	22.0 (14.0, 29.0)		11.0 (8.0, 12.0)		26.0 (19.0, 30.0)	
Cigarette smoker							
Never	210 (87.5%)	20.5 (14.0, 29.0)	0.71	11.0 (8.0, 12.0)	0.642	26.0 (21.0, 29.0)	0.53
Yes	30 (12.5%)	18.0 (12.0, 29.0)		10.5 (8.0, 12.0)		26.5 (17.0, 29.0)	
Cig. smoking pack.year	5.6 (2.2, 20.0)[a]	−0.210[b]	0.266	−0.044[b]	0.816	0.034[b]	0.857
Regular physical activity							
No	212 (88.3%)	21.0 (14.0, 29.0)	0.132	11.0 (8.0, 12.0)	0.29	26.0 (20.0, 29.0)	0.946
Yes	28 (11.7%)	16.5 (12.0, 27.0)		12.0 (9.5, 12.0)		26.0 (22.0, 29.0)	
Chronic diseases							
None	172 (71.7%)	19.5 (14.5, 27.5)	0.64	11.0 (8.0, 12.0)	0.371	26.0 (20.0, 29.0)	0.145
Single disease	53 (22.1%)	24.0 (12.0, 31.0)		11.0 (9.0, 12.0)		27.0 (21.0, 30.0)	
Multiple diseases	15 (6.3%)	19.0 (16.0, 35.0)		10.0 (8.0, 14.0)		27.0 (21.0, 37.0)	
Current job title							
Lecturer	133 (55.4%)	22.0 (15.0, 30.0)	0.223	11.0 (9.0, 12.0)	0.515	26.0 (21.0, 29.0)	0.803
Associate Professor	62 (25.8%)	18.0 (14.0, 26.0)		11.0 (8.0, 12.0)		26.5 (20.0, 30.0)	
Professor/Professor Emeritus	45 (18.8%)	18.0 (12.0, 25.0)		10.0 (8.0, 12.0)		26.0 (23.0, 29.0)	
Professional specialties							
Art and Social Sciences	66 (27.5%)	18.5 (13.0, 27.0)	**0.015***	11.0 (9.0, 12.0)	0.784	26.5 (22.0, 29.0)	**0.039***
Life Sciences	60 (25.0%)	24.0 (17.5, 32.5)		11.0 (8.0, 13.0)		24.0 (16.5, 28.5)	
Other Sciences	114 (47.5%)	18.0 (13.0, 25.0)		11.0 (8.0, 12.0)		27.0 (21.0, 29.0)	

(Continued)

TABLE 1 | Continued

Characteristics	n (%)	Occupational burnout domains, median (IQR)					
		EE	p-value	DP	p-value	PA	p-value
Years of employment							
<10	51 (21.3%)	21.0 (14.0, 29.0)	0.115	11.0 (10.0, 12.0)	0.283	26.0 (21.0, 30.0)	0.74
10–20	123 (51.2%)	22.0 (15.0, 30.0)		11.0 (8.0, 12.0)		26.0 (20.0, 29.0)	
More than 20	66 (27.5%)	17.5 (12.0, 25.0)		11.0 (7.0, 12.0)		26.0 (21.0, 29.0)	
Workdays/week	4 (4, 5)[a]	0.088[b]	0.172	0.172[b]	**0.007***	0.179[b]	**0.005***
Workhours /day	6 (5, 8)[a]	−0.041[b]	0.531	0.041[b]	0.524	0.111[b]	0.086
Telework hours/week	16 (10, 20)[a]	0.138[b]	**0.033***	0.131[b]	**0.044***	0.167[b]	**0.010***

[a]Median (interquartile range).
[b]Spearman's rho correlation coefficient.
*Statistically significant value of p (<0.05); Mann-Whitney or Kruskal-Wallis tests.
EE, emotional exhaustion; DP, depersonalization; PA, professional accomplishment; IQR, interquartile range.

Table 3 shows the adjusted associations between the level (low, moderate, and high) of respondents' scores on each burnout dimension (EE, DP, and PA) and the absenteeism and presenteeism rates in the last 28 days. The EE was the only burnout dimension that showed a statistically significant association between absenteeism and presenteeism. Respondents with moderate and high burnout scores in the EE dimension had a significantly high absenteeism rate; 2.1 and 3.3 times the rates among respondents with low burnout scores in EE, respectively. Likewise, respondents with moderate and high burnout scores in the EE dimension had a significantly high presenteeism rate; 2.4 and 4.7 times the rates among respondents with low burnout scores in EE, respectively. All of these associations were adjusted for respondents' age, gender, residence, marital status, number of children, professional specialties, years of employment, workdays per week, telework hours/week, work hours per day, regular physical activity, and number of chronic diseases.

DISCUSSION

Although burnout has been extensively described among health professionals worldwide and in the Eastern Mediterranean region (33), limited research was performed among academic university staff, particularly in low middle-income countries. In developed countries, burnout among faculty has been an important issue for decades with increasing responsibilities and tasks diversity (34). In the current study, 28 and 18.3% of the academic staff had high EE and DP, respectively, while 88.3% had low PA. Seventy percent of respondents reported a high burnout in at least one dimension while 7.1% reported high burnout in all dimensions. The EE was significantly associated with productivity loss (i.e., days of absenteeism and presenteeism). A **Supplementary Table S1** summarizes our study findings when compared to similar studies in the literature.

The prevalence of burnout in our study is nearly consistent with a study conducted by Aleves et al. (35), which reported that 33.6% of a sample of 366 faculty members in a public Brazilian university reported high burnout. Other studies in Europe, North and South America reported variable estimates of

burnout prevalence among faculty members, ranging from 14 to 40% (36–38).

In Soler et al. (24), a multinational study was conducted on 1,393 family physicians in 12 European Countries (Bulgaria, Croatia, France, Greece, Hungary, Italy, Malta Poland, Spain, Sweden, Turkey, and United Kingdom), 43.0% of respondents scored high on EE burnout dimension while 35.3 and 32.0% reported high DP and PA, respectively. Compared to Soler's findings, our study's respondents scored low on EE and DP burnout domains while they scored very high on the PA domain.

The current study showed that the female gender was associated significantly with higher EE scores. This finding was consistent with the Alves et al.'s (35) study, which reported that women were more exhausted than men. In contrast, Soler et al. (24) reported that men had significantly higher EE scores than women.

The dominance of men working in academic jobs at the Egyptian universities may explain the gender difference in our study (39). Despite the paucity of national estimates for female academic staff in the Egyptian universities, findings from a German Academic Exchange Service (DAAD)-funded project entitled "Gender Equality in the Egyptian Higher Education System, carried out from 2012 to 2014" showed a low frequency of female academic staff in the Egyptian universities (ranged from 34.6 to 41.9%), particularly at universities in Upper Egypt (ranged from 5.9 to 18.5%). Furthermore, the project's findings denoted that most Egyptian universities lack programs, which maintain work-life balance and facilitate the integration of female graduates into the academic careers (40).

The current study's findings were consistent with an earlier report by Miller (41) in that living in remote areas was associated with higher EE among teachers than in living in the same governorate where they work, given that individuals who travel long distances for work were more susceptible to bad weather and other road and time obstacles than those who live in areas of a short distance from work.

Our study showed that faculty members in health and life sciences specialties had significantly higher EE and less PA. These results were not consistent with Alves et al. (35), which reported

TABLE 2 | Distribution of respondents' absenteeism and presenteeism days by their demographic, health, and work characteristics (*N* = 240).

Characteristics	*n*	Productivity loss (days), median (IQR)			
		Absenteeism	*p*-value	Presenteeism	*p*-value
Age, years					
<40	89	0.0 (0.0, 1.5)	0.737	2.4 (1.0, 4.0)	0.204
40–49	104	0.0 (0.0, 1.5)		2.6 (1.4, 4.3)	
50 or older	47	0.0 (0.0, 1.5)		2.0 (1.0, 3.2)	
Gender					
Male	175	0.0 (0.0, 1.5)	0.247	2.0 (1.0, 4.0)	0.08
Female	65	0.5 (0.0, 2.0)		3.0 (1.5, 4.0)	
Residence					
The same governorate	197	0.0 (0.0, 1.5)	0.109	2.1 (1.0, 4.0)	**0.012***
Remote governorate	43	1.0 (0.0, 2.0)		3.2 (1.5, 5.0)	
Marital status					
Single	11	1.5 (0.0, 2.6)	0.446	3.0 (1.8, 4.5)	0.845
Married	214	0.0 (0.0, 1.5)		2.3 (1.0, 4.0)	
Divorced or widowed	15	0.5 (0.0, 1.5)		1.8 (1.0, 3.9)	
Number of offspring					
None	33	0.0 (0.0, 2.0)	0.709	2.4 (1.0, 3.5)	0.537
1–2	64	0.0 (0.0, 1.5)		2.5 (1.3, 4.0)	
3 or more	143	0.0 (0.0, 1.5)		2.4 (1.2, 4.0)	
Age of youngest offspring (*n* = 207)					
<5	85	0.5 (0.0, 2.0)	0.74	3.1 (1.2, 5.3)	0.571
5–17	106	0.0 (0.0, 1.5)		2.5 (1.3, 4.0)	
18+	16	0.0 (0.0, 1.5)		2.1 (1.2, 4.0)	
Body mass index class					
Normal	42	0.0 (0.0, 2.0)	0.852	2.1 (1.0, 4.0)	0.806
Overweight	110	0.3 (0.0, 1.5)		2.4 (1.4, 4.0)	
Obese	87	0.0 (0.0, 1.5)		2.4 (1.0, 4.0)	
Cigarette smoker					
Never	210	0.0 (0.0, 1.5)	0.318	2.5 (1.2, 4.0)	0.293
Yes	30	0.0 (0.0, 1.0)		2.0 (1.0, 3.2)	
Cig. smoking pack.year	240	0.125[a]	0.509	0.078[a]	0.681
Regular physical activity					
No	212	0.0 (0.0, 1.5)	0.208	2.5 (1.2, 4.0)	0.223
Yes	28	0.0 (0.0, 1.0)		2.0 (1.0, 3.5)	
Chronic diseases					
None	172	0.0 (0.0, 1.5)	0.453	2.4 (1.2, 3.9)	0.315
Single disease	53	0.5 (0.0, 1.5)		2.8 (0.8, 5.0)	
Multiple diseases	15	1.0 (0.0, 2.0)		2.5 (1.3, 5.0)	
Current job title					
Lecturer	133	0.0 (0.0, 1.5)	0.591	2.5 (1.2, 4.0)	0.7
Associate Professor	62	0.0 (0.0, 1.5)		2.9 (1.0, 4.0)	
Professor/Professor Emeritus	45	0.5 (0.0, 1.0)		2.0 (1.2, 3.0)	
Professional specialties					
Art and Social Sciences	66	0.0 (0.0, 1.0)	**0.040***	2.4 (1.0, 4.0)	**0.039***
Life Sciences	60	0.8 (0.0, 2.0)		3.1 (1.4, 4.9)	
Other Sciences	114	0.0 (0.0, 1.5)		2.0 (1.0, 3.5)	

(Continued)

TABLE 2 | Continued

Characteristics	n	Productivity loss (days), median (IQR)			
		Absenteeism	p-value	Presenteeism	p-value
Years of employment					
<10	51	0.5 (0.0, 1.5)	0.901	2.2 (1.2, 4.0)	0.581
10–20	123	0.0 (0.0, 1.5)		2.6 (1.0, 40)	
More than 20	66	0.0 (0.0, 1.5)		2.0 (1.1, 3.5)	
Workdays/week	240	0.038[a]	0.561	0.140[a]	**0.031***
Workhours/day	240	0.031[a]	0.631	−0.016[a]	0.809
Telework hours/week	240	−0.051[a]	0.434	0.136[a]	**0.037***

IQR, interquartile range.

[a]Spearman's rho correlation coefficient.

*Statistically significant value of p (<0.05); Kruskal-Wallis test.

TABLE 3 | Multivariable analysis[a] for the association between burnout and productivity loss (absenteeism and presenteeism rates) in the studied sample (N = 240).

Burnout domains	n	Absenteeism (days)			Presenteeism (days)		
		Rate ratio	95% CI	p-value	Rate Ratio	95% CI	p-value
Emotional exhaustion							
Low	85	1			1		
Moderate	88	2.05	1.05–4.01	0.036*	2.38	1.32–4.29	0.004*
High	67	3.33	1.43–7.79	0.005*	4.67	1.97–11.05	0.000*
Depersonalization							
Low	40	1			1		
Moderate	156	1.01	0.46–2.25	0.973	1.29	0.66–2.53	0.465
High	44	1.47	0.48–4.52	0.497	1.14	0.37–3.49	0.826
Personal accomplishment							
High	4	1			1		
Moderate	24	0.38	0.06–2.36	0.297	1.43	0.30–6.79	0.650
Low	212	0.59	0.11–3.28	0.550	1.37	0.28–6.78	0.700
Intercept	240	0.24	0.01–10.9	0.466	0.11	0.004–3.49	0.212

CI, confidence interval.

[a]Negative binomial regression model; adjusted for age (years), gender, residence, marital status, number of children, professional specialties, years of employment, telework hours/week, work hours per day, regular physical activity, and number of chronic diseases.

*Statistically significant at 95% level of confidence.

that there were no significant differences among faculty members from the different fields of knowledge. Furthermore, our study results indicated that increasing the number of telework hours per week was significantly associated with increased EE, DP, and PA. Telework implies remote work where the online work is an important component. Whenever the academic institutions adopt a remote teaching model, they have to invest more in the correct technologies and IT support. Using the wrong technology increases the burden on the faculty members to make the remote teaching model successfully work, which is basically a recipe for increasing workload and work-family conflict for burnout (42).

Female academic staff in our study experienced more productivity loss (i.e., higher median days of absenteeism and presenteeism) than male staff. These findings agreed with Miller's study (41). This finding could be explained by the increased work-family conflict and the higher burnout among female academic staff. Female faculty members combine more work and home responsibilities than men. A study by Burk and El-Kot (43) among Egyptian professionals has reported higher levels of work-family conflict, exhaustion, and psychosomatic symptoms among working women as compared to men. Another study by Marafi (44) reported that the main challenge and the leading cause of work-life conflict among professional female workers in Egypt was the lack of time available for women to fulfill their work duties and family responsibilities.

The current study results showed that moderate and high emotional exhaustion were significant predictors of the increased absenteeism and presenteeism. These findings were consistent with the findings of a Chinese study by Pie et al. (45) in which respondents with a medium or high EE and PD had twice or more presenteeism than those with low EE or PD. Furthermore, our findings were consistent with a systematic review by Dewa et al. (19), which reported a significant negative relationship between burnout and productivity which were assessed in four domains:

the number of sick leave days, intent to continue practicing, intent to change jobs, and work ability. Likewise, Ruitenburg et al. (46), a study from one academic medical center in the Netherlands, found that physicians' self-perceived insufficient work ability was associated with high Burnout. High scores in EE and DP dimensions of burnout had significantly 9.5 times greater odds of having self-perceived insufficient work ability. In contrast, our study showed a similar association but of less magnitude and with only the EE domain. In a study by Woo et al. (34) on the relationship between faculty burnout and scholarly productivity among 251 faculty members in the U.S. results, burnout was a predictive of scholarly productivity ($r = -0.216$; $p < 0.05$). Faculty members with a high burnout showed a significantly low scholarly productivity as compared to those who exhibited less burnout. Soler et al. (24) reported an increased sick leave with different high burnout dimensions: high EE and DP and with Low PA. In contrast, the study of Siu et al. (47) showed no relation between different burnout dimensions and sick leaves.

In the current study, absenteeism was one of the outcomes of burnout and a cause of productivity loss as absent teachers are typically replaced by less qualified substitutes or their tasks were redistributed to their colleagues, which leads to an increase in the burden on the rest of the colleagues and thus the efficiency, instructional intensity and consistency, and quality of education may decline. Moreover, burnout syndrome can also incapacitate faculty members from work through different personal dysfunctions, such as serious psychological and physical disorders (i.e., presenteeism) (48). Findings of our study contribute significantly to the literature on burnout among academic staff in universities and have several practical implications. University policies should be implemented at the individual and institutional levels to mitigate burnout and foster productivity among academic staff. Such arrangements should be particularly targeted at female faculty, working in life-sciences specialties, increasing telework, and accommodation.

The main limitations in this study that should be taken into consideration while interpreting its findings were the single-center experience (i.e., single academic institution) and the cross-sectional design, which cannot ascertain the causal inferences. For future research, other methodological designs can be used (with longitudinal studies and probabilistic sampling) by including universities of different legal natures (public and private) and also including more detailed specialties of academia. Quantification of the magnitude of association between burnout and productivity loss should be evaluated in further studies.

CONCLUSIONS

Academic staff showed a high prevalence of at least one burnout dimension. Moderate and high burnout scores in the EE dimension were significantly associated with high productivity loss as higher absenteeism and presenteeism rates when compared to low EE. Women, remote residence, life science specialties, and increasing telework hours per week were significantly associated with higher median scores for burnout in the EE dimension. Increased number of workdays and telework hours per week was significantly associated with higher median scores for burnout in the DP dimension. Life science specialties were associated with lower median score for burnout in the PA dimension, while increasing the number of workdays and telework hours per week were associated with higher median scores for PA.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

ETHICS STATEMENT

This study was approved by the Ethical Committee at Faculty of Medicine, Suez Canal University, Ismailia, Egypt. All participants gave their informed consent prior to participation in this study.

AUTHOR CONTRIBUTIONS

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SUPPLEMENTARY MATERIAL

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Social Media Support and Funding Assistance for Psychological Injuries in Social Work

Xiaowu Hu[1], Caiyi Tang[1] and Dongmei Wang[2]*

[1] Department of Social Work and Social Policy, School of Social and Behavioral Sciences, Nanjing University, Nanjing, China,
[2] Department of Psychology, School of Social and Behavioral Sciences, Nanjing University, Nanjing, China

Introduction: Psychological injuries in social work are on the rise in complex modern society. Some individuals are incurring both physical and psychological injuries. Often, psychological injuries are more miserable than physical injuries. To combat the psychological injury suffered by individuals involved in social work, authorities should mobilize support via social media and raise funds by this and other feasible means to cover the cost of care for these individuals. This study focuses on social media support and funding assistance that could play useful roles in helping to treat psychological injuries among social workers and their clients in China.

Methods: A scoping review of academic and gray literature was undertaken to identify the different injuries involved in social work. Semi-structured interviews were carried out with 7 experts, including social workers, social media professionals, and social fund directors. Empirical studies on psychological injuries in social work provided examples in support of the policy advocacy reported in this paper.

Results: The scoping review found diverse literature on the subject of psychological injury in social work over the past decade in China. Semi-structured interviews with experts indicate that social media support can alleviate psychological suffering and that funding assistance has a positive influence on assisting individuals coping with psychological injuries. The empirical cases support the plan to encourage more support from social media and funding sources.

Conclusion: Psychological injury is greatly influenced by social bias and discrimination. According to cases and actions are taken to mitigate the harm done, supportive social media strategies could greatly diminish the psychological injuries to social workers and their clients and help them avoid much suffering. This study finds that funding organizations could provide a new treatment mechanism—social media marketing strategies and functional activities—to help a large number of individuals with psychological injuries out of the disease trap in China.

Keywords: psychological injury, social work, social media, funding assistance, social marketing

INTRODUCTION

There is inevitably an increase in the sum of psychological harm in social work practice worldwide. In these suffering groups, there were children, adolescents, elderly individuals, college students, grassroots workers, vocational staff, and social workers. Trauma often occurs after a great change in living conditions or society, especially unexpected social and natural disasters such as an earthquake, flood, infectious disease, or serious transportation accident. According to the literature, there are a great many individuals with resulting psychological damage involved as caregivers and clients in social work. More than 100 million individuals in China suffer from psychological trauma. Understanding the different causes of psychological injury groups is the first step toward taking actions to help them.

In China, most of the children who suffer psychological injury are migrants, who are adversely affected by the processes of urbanization and modernization, as they are forced to change their living environment. Further, while under pressure to conform to their new lifestyles, migrant children cannot often communicate with their new urban peers (1). Another group of children who are vulnerable to psychological harm is left-behind children in rural areas. Because of the acceleration of urbanization, parents often leave their children behind with relatives while they seek employment in urban centers. These children lack the care and guidance of their parents, and their emotional needs, such as attachment and communication, cannot be met. There is a sense of alienation between these children and their parents. Xie Jiandu and Cai Xiaodong found that left-behind children generally exhibit inferiority, autism, depression, introversion, and low self-esteem (2). Cao Ziai, Wudi, and others believe that left-behind children have self-cognition problems, interpersonal relationship issues, and negative personality traits that compromise their mental health (3). In addition, among the children who have suffered psychological harm are those in orphanages and children with congenital diseases.

The mental health and psychological problems of adolescents are mainly concentrated in three aspects: family, peer groups, and cyberspace. Peer groups have a very important impact on the mental health of young people. Individuals with psychological issues cannot handle relationships among peer groups very well. They are prone to physical cognitive biases, a lack of self-confidence and self-efficacy, and even school weariness and persistent violent attacks on campus. Zhang Yingying and Zeng Yu believe that the negative emotions generated in peer-group relationships can cause school maladjustment, high-risk behaviors, and behavioral disorders among teenagers and may lead to emotional problems such as social anxiety, social depression, social fear, and loneliness (4). Families play an important and irreplaceable role in the growth of adolescents. Li Zhenpeng believes that most single parents usually cannot provide good support for the psychological development of youth, so these children are challenged in the practice of constructing self-identity, and they will have psychological deviations because of the loneliness and depression in their daily lives (5). Many adolescents have active online lives, but

social lives conducted via the internet can have harmful effects on young people because of cheating, false advertisements, and emotional deception that those they communicate with can perpetuate. Thus, many adolescents suffer psychological injury from internet addiction, abusive interactions, and a sense of inferiority generated by the lives of others they see online.

In social work, many elderly individuals are seen for psychological injury due to physical disease, loneliness, and social exclusion. China's population is rapidly aging. The mismatch between demand for services and dashed expectations has led to a series of psychological problems for elderly individuals seeking help. Yang Ling, Jin Xiafang, and others believe that age is the source of many psychological problems such as loneliness, worry, and anxiety (6). Zhou H's team found that elderly individuals living in nursing homes are more psychologically negative (7).

It is a new phenomenon in social work practice that an increasing number of college students are reporting psychological distress, and the incidence of suicides is on the rise in many places. The pressures of schoolwork, academic competition, personal choices and worries, complicated interpersonal relationships, conflicts, and failures in love all-cause college students to have serious physical and mental health problems. Related survey data show that the mental health of college students in China has increased rapidly. A considerable number of colleges report negative and stressful environments. College students who drop out due to mental illness account for more than 50% of the total number of dropouts. Psychological problems have become an important factor affecting the individual development of college students and the stability of their schools (8).

Even grassroots workers and vocational staff are currently experiencing psychological anxiety. The fast tempo of the contemporary marketplace and changing values are pushing blue-collar and white-collar workers into a fierce competitive life stage and social comparison (9). Anxiety from work, life, interpersonal relationships, and career prospects have led to growing psychological stress among grassroots workers and vocational staff, such as technical personnel, doctors, nurses, teachers, professors, judges, social workers, and therapists. Although these professionals have a high degree of social recognition, the pressure of their responsibilities is too high, and social support is insufficient, which leads to a decrease in self-efficacy and an increase in psychological problems (10). Enduring emotional pressure and lacking social support have resulted in job burnout, low subjective well-being, huge work anxiety, and psychological trauma.

Meanwhile, due to the outbreak of Coronavirus Disease 2019 (COVID-19), millions of people have experienced new psychological harm as a consequence of the virus and anti-viral measures, including home quarantine, isolation, and physical illness while they may also incur a loss of income. In addition to disaster-stricken people, groups such as medical workers and social workers who participate in the rescue of others will also be affected by overwork, reduced social support, and exceeding expectations in the process of rescue and assistance. Under pressure, negative psychological emotions such as fear,

anxiety, tension, grief and helplessness, depression, and sadness occur (11).

Indeed, there is a large number of psychological injuries found in social work practice in China at the time of fast urbanization, high competitiveness, the transition to a market economy, and individual achievement. Therefore, we should find practical strategies and take effective actions to address this problem. In this study, we aim to conduct a scoping review of the published articles and interview 7 experts to identify the roles of social media support and funding assistance in helping to treat psychological injuries among social workers and their clients in China. Furthermore, A new mechanism of social work on psychological injury is proposed.

MATERIALS AND METHODS

Scoping Review of Literature

A scoping review of the existing academic and gray literature was undertaken to examine the traditional social work actions taken to address psychological harm. We found that social work clients may be categorized as case work, group work, or community work and that individuals from different backgrounds had different psychological problems. Semi-structured interviews provided more information and inspiration for practical measures to resolve psychological harm.

Case work has a very prominent role in improving psychological health. It started at the end of World War I in response to the worldwide economic crisis in 1929. The strong influence of German psychoanalytic psychology helped case work begin to use psychoanalytic methods to help recipients solve problems, and it formed the characteristics of focusing on personal psychological factors rather than social environment (12). Case work on psychological injury is mainly based on the therapy of psychological clinics and hospitals. This mainly focuses on the psychological aspect, and the concept of "people in the environment" is tantamount to targeting different life stages, such as children, adolescents, and elderly individuals, and groups in different environments, such as migrant children, poor college students, disaster-affected people, and patients with diseases. This method also gives corresponding solutions to psychological problems. Regarding the six groups mentioned in the first part, we can appreciate the uniqueness of case work to each vulnerable group. The greatest advantage of case work is that it can solve problems from person to person. At the same time, the client can respond in a relatively short period. For example, after the outbreak of COVID-19, the most successful way to intervene in the burnout of medical staff was case work (13). Correspondingly, because of its strong pertinence and individuality, case work has the disadvantages of being time-consuming, high cost, and low impact. Therefore, case work is limited in China due to the large population.

Group work is helpful and practical when dealing with psychological injury. Based on psychoanalytic theory, the group work method has effective functions for common psychological activities in groups, especially teenagers. Teenagers often cluster because they are afraid of loneliness, and they pursue identity

and other developmental characteristics. Group work has the advantage of solving the psychological problems of adolescents while meeting their needs for peer recognition. It focuses on helping group members form a mutual aid partnership to obtain high cohesion and a sense of security so they can express their feelings and thoughts more openly. However, excessive pursuit of organizational strength will inevitably neglect individual needs. Therefore, cultivating group cohesion is an essential and important part of group work, but there will still be insufficient assessments of team members' awareness and the degree of psychological change in group work, which will lead to unclear progress in personal transformation and resocialization (14).

Community work is a comparatively new method to address psychological harm. There is an increasing number of special groups, such as "left-behind children" and "empty nesters", in the rapid urbanization period in modern China (15). This prompts community work to play an important role in addressing the new psychological problems of clients produced by uneven urbanization in China. Community social work focuses on changes in the macrosocial environment and ecological system to relieve the burdens of clients who lack opportunities and resources. However, community social work requires the innovation of social policy and an institutional supply of resources, and it is a long and slow method to cope with the urgent problem of psychological injuries in children, elderly individuals, and other groups who are suffering from the impact of urbanization and aging.

Semi-structured Interviews

In this study, we interviewed 7 experts from different institutions including social workers, social media professionals, and social fund directors. A summary of the interviewees' information is listed here: A, social worker; B, psychiatrist; C, university psychological counselor; D, professor of social work; E, media thinktank expert; F, an official of Health Commission; G, professor of social policy. The 7 interviewees were interviewed informally following a rough outline of the interview. Three questions are asked like this: Q1: Why there is increasing growth of psychological injuries? Q2: How can we help a large number of psychological injuries? Q3: Does the social media strategy conduct effectively today?

After summarizing the answers of the experts, all the interviewers agree that the traditional social work actions and clinical methods aren't enough to resolve the millions of psychological injuries in China today, there must be a Marco-intervention strategy and social media is an actual choice. For example, F tells that there are certain encouraging policies to welcome social strength to play an active role in the public health program such as the online volunteer service. And there are thousands of psychologists setting up online counseling services to run businesses. This online service is a kind of social media strategy of B to C service. Experts recommend that social media as a new and open platform that can be effectively utilized to help more psychological injuries through online social media community interactive communication. ABCDEG advise that the government set up a new policy to encourage the cooperation between foundations and social organizations to establish more

influential social media APP to welcome more psychologist, social worker, injuries, and other volunteers who could interact freely, safely, efficiently, and effectively.

Relevant Policies on the Media

From the literature and expert interviews, it finds that although traditional social work strategies can play helpful roles in dealing with psychological injuries, these strategies also have many disadvantages, such as the low efficiency of case work, the slow progress of group work, and the higher cost of community social work. We are concerned about the increasing number of people who have suffered or are vulnerable to psychological harm. Social-macro strategies must be applied to develop useful and feasible approaches to address psychological injury in social work. Then, media intervention is a way to address social problems and issues. The media is undoubtedly the best platform on which to influence public opinion and transmit information. At the same time, the rapid development of new media is not only one of the reasons for the psychological problems of most groups but also a key channel of psychological relief and counseling because of its ability to rapidly transmit information and knowledge to an extensive audience [16].

At present, the scale of Chinese internet users is the largest in the world, and the internet penetration rate exceeds the global average. How policies are formed and transmitted via the internet and online psychological counseling is conducted is changing daily. Therefore, the policies described in this article promote the psychological intervention of social work via social media applications, including new media such as Weibo, WeChat, and specific apps. We know that policies controlling the media control are becoming more regulative and institutional. A series of media policies have been put in place to encourage their development and monitoring. The details of the relevant policies are shown in **Table 1**.

In 2008, the State Council issued the "Opinions of the State Council on Policies and Measures to Support the Post-Wenchuan Earthquake Recovery and Reconstruction", which proposed the policy of "one side in trouble, eight sides supporting, self-reliance and hard work", combining state support, social assistance, and production self-help [17]. The Ministry of Civil Affairs issued the "Guidance on Supporting and Guiding Social Forces in Disaster Relief Work" on October 8, 2015, and for the first time, the participation of social forces in disaster relief work was included in the government's normative system [18]. In 2014, China moved from a "big network country" to a "strong network country" in a year when cyberspace became clearer, positive network energy became more enormous, and China began to enter the "new normal" of the Internet [19]. The increasing popularity of mobile Internet provides a platform and basis for preventing and solving psychological problems. In 2015, the General Office of the State Council issued, and the Health and Family Planning Commission and other departments jointly issued, the Notice of National Mental Health Work Plan (2015–2020), which included mental health work as an important initiative to protect and improve people's livelihood and strengthen and innovate social management, and was included in the overall plan of national economic and social

TABLE 1 | Media policies issued by the central government.

Serial number	Time	Policy name	Introducing department
1	March 2002	"Opinions on Further Strengthening Internet News Propaganda and Information Content Management"	General Office of the Central Committee of the Communist Party of China, General Office of the State Council
2	February 2005	"Administrative Measures for the Recordation of Noncommercial internet Information Services"	Ministry of Information Industry
3	January 2017	"Opinions on Promoting the Healthy and Orderly Development of Mobile internet"	General Office of the Central Committee of the Communist Party of China, General Office of the State Council
4	May 2017	"Internet News Information Service Management Regulations", "Internet News Information Service License Management Implementation Rules", "Internet Information Content Management Administrative Law Enforcement Procedures Regulations"	National Internet Information Office
5	November 2018	"Regulations on the Security Evaluation of internet Information Services with Public Opinion Attributes or Social Mobilization Capabilities"	National Internet Information Office
6	December 2019	"Regulations on the Ecological Governance of Network Information Content"	National Internet Information Office

development [20]. In 2018, the General Office of the State Council issued the Opinions on Promoting the Healthy and Orderly Development of New Media for Government Affairs, pointing out that new media for government affairs is an important channel for the Party and the government to contact the masses, serve the masses and unite the masses in the mobile Internet era, an important means to accelerate the transformation of government functions and build a service-oriented government, an important position to guide online public opinion and build clear cyberspace, and an important way to explore new modes of social governance and It is an important way to explore new modes of social governance and improve social governance capacity [21]. In 2020, in the face of the sudden new coronavirus pneumonia epidemic, in early March, the National Health and Health Commission and the Ministry of Civil Affairs jointly issued a notice requiring the strengthening of psychological assistance and social work services for those infected with new coronavirus pneumonia, those isolated and front-line workers in the prevention and control of the new coronavirus pneumonia epidemic; on March 18, the State Council issued the "New Coronavirus Pneumonia Epidemic Psychological Relief in the Joint Prevention and Control Mechanism Work Program", requiring relevant departments to provide care, social support, psychological guidance, and other

services according to the characteristics and psychological service needs of different groups of people (22).

Meanwhile, online ethics have made it much more convenient for professional social media experts to work with psychological injuries (23). We can take advantage of social media to support the resolution of psychological injury problems.

Because of the close relationship between social media to human social life and its immediacy, different groups will be affected at this time. To a large extent, social media can reflect social reality and people's thoughts, values, emotions, and psychological states. Whether it is a certain stage in the human life cycle or the psychological problems caused by social factors, the internet offers the opportunity for issues to be widely discussed and even resolved through social media. Therefore, social media is an effective way to carry out social work, influence public opinion, and gather support. At present, common public opinions in response to psychological problems include rumor-based posts on public sites, doubtful public sentiments, help-seeking queries, supervisory input, and complex psychological discussions (24). Social workers can use public dialogue on social media platforms to decipher rumors, spread truth, and guide the correct values and ideas about life and the world; they can resolve doubts and provide more practical access to complete social supervision and social accountability for psychological injuries.

RESULTS

The literature scoping shows that we can do a lot to relieve the psychological injuries in social work through traditional case work, group work, and community work, but we should also renew the strategy of employing social media as a means of healing psychological injuries in social work.

Semi-structured expert interviews show that we are facing a more regulated social media policy environment in China. Using social media to help psychological injury in social work will require more effective and practical strategies to reach the huge majority of Chinese people, including teenagers and elderly individuals, who carry smartphones. Interviews indicate a need for more public and private funds to support the social media strategy regarding social work.

DISCUSSION

There is a common consensus on the effective function of social media in addressing psychological injury in social work, Studies have shown that social media have a positive effect on the prevention, improvement, and treatment of psychological problems. Taking the college student group as an example, Feng Dan argues that new media has the advantages of timeliness and interactivity, which enriches the content and enhances the effectiveness of moral education in colleges and universities (25), and Song Yueqiang argues that the development of new media has, to a certain extent, promoted the development of peer psychological guidance and facilitated the psychological guidance

work for some students (26). Chen Jin and Chen Wenjie's article specifically refine the advantages into three aspects: opening up the horizons of the caseworkers and helping them to improve and perfect their psychological mechanisms; expanding the activity space and coverage of mental health education work, which can also enhance the early warning function of mental health education; and facilitating the popularization of mental health education knowledge and creating a general environment for mental health education (27). These are the advantages of social media for college student groups in solving psychological problems. Facing broader social groups, such as citizens affected by epidemics, scholars such as Peng Zongchao and Huang Hao believe that media advocacy is very important for timely and effective prevention and response to the uncertain risk of unexplained infectious diseases (28). Li Jingxiu suggests that full media creates a "democratic" discourse that helps to release the negative emotions of audience opinion promptly, alleviate social conflicts, and promote harmony (29).

Next, we should find better strategies to push social media into a stronger role in dealing with psychological injuries in an increasingly open society. In addition to influencing public opinion, we might look to the internet to seek funding from specific charities. Social media support is a strategy of public opinion advocation and persuasion, and it can do much in recognizing and diminishing panic about the psychological injury. Meanwhile, funding assistance is a financial tool that can cover social media strategies and traditional social work methods with a sufficient budget. Therefore, we should make full use of social media support and financial assistance to modify the traditional model into a new one to help more people with psychological injuries avoid harm and suffering. The details are shown in **Figure 1**.

Creating Influencers in the Public Opinion Environment

The similarity is an important factor that enables information dissemination to resonate, stimulate discussion, and promote development, is the empathy among users of social media platforms. When a social event becomes a hot topic and attracts the attention of many people, the event must be somehow related to the interests of the majority. However, the level of understanding and discriminating ability of each group and individual is different, and most people do not have a clear direction and thorough insight. Thus, the guidance of opinion leaders or influencers is extremely important. It can be said that the ability of opinion leaders to disseminate information independently and effectively across social networks is vital. They can gather people who were originally in a state of dissociation based on connections hidden in the social network and bring them into the conversation. In the social network, the entire environment becomes tight and orderly (30). Influencers' opinions on social media platforms can exert much influence on the common mass, including psychologically vulnerable groups.

Applying opinion leaders to the support of public opinion on mental health issues can be promoted through the mainstream media. For example, *The People's Daily*, *Guangming Daily,* and

FIGURE 1 | The new mechanism of social work on psychological injury.
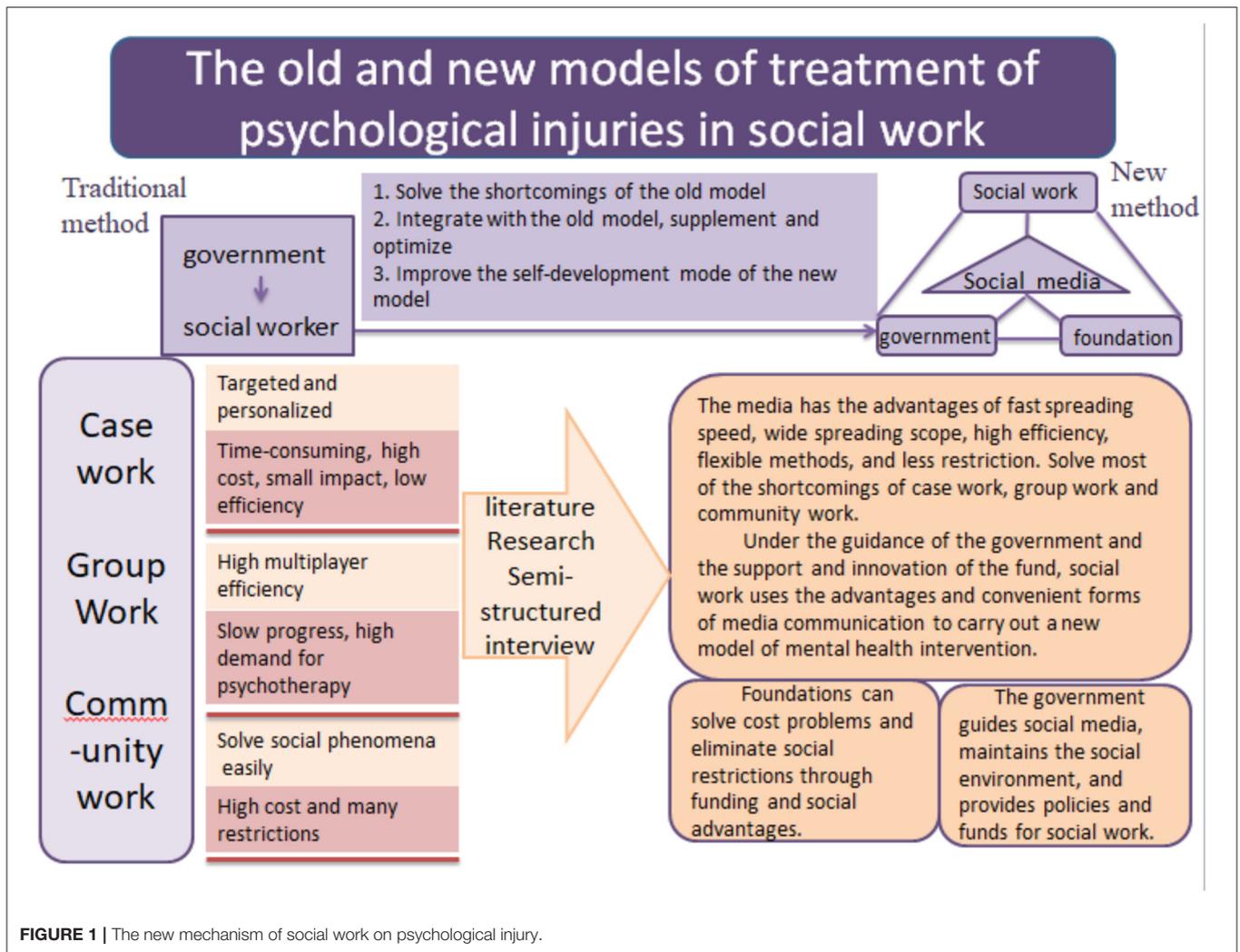
the Voice of CCBC in traditional media and their new media apps and we-media are platforms that reach an extensive audience and can be used to cultivate credibility in the minds of the public. The official account of the Central Committee of the Communist Youth League on WeChat is one group through which we can voice support, and there are similar groups with great influence such as Weibo big bloggers, famous uploaders, known scholars, and star actors that could serve to spread authoritative opinions about psychological injuries when people encounter confusing information which might harm their mental health.

Incorporating Knowledge Into the Media to Develop Communication Advantages

In addition to swaying public opinion, the use of social media also needs to satisfy the curiosity and cognition of the public. Therefore, the content, science popularization, and explanations are particularly important. For the popularization of knowledge, the more common and effective methods are books, publications, and scientific and educational radio and television programs. These forms of content dissemination are activities supported by

the national government in the interest of social awareness and development. Such forms are highly controllable and professional and have made outstanding contributions to public opinion.

However, with the development of the internet, the communication effect of traditional media has been declining, and the development of new media and convergence media has become mainstream. Therefore, we need to bring public opinion support for mental health issues to new online media, expand the spread of content, and increase the sense of participation and recognition of the public under the premise of ensuring professionalism and controllability (31). Ways with a wide range of influence include public service advertisements, short videos, Moments links, and WeChat official accounts. Through the interoperability and mission of the networks, public opinion is quickly spread to achieve the strong support of the public.

Collaborating With the Government to Accurately Monitor Public Opinion

Traditional media has good controllability and professionalism, and new media has strong dissemination in real-time. While each

has its advantages and disadvantages, learning from each other's strengths is an urgent matter. When public opinion emerged in the past, it only relied on traditional media, and after discussion and exchange, a time was chosen to explain the issue to the public. In the new media age, the rapid and violent dissemination of news and opinions is more difficult to control. It is too late to take relevant measures after dissemination, and if the reaction to the post is negative, it will also have a detrimental impact on the credibility of the individuals, organizations, and the government associated with the message. Therefore, an accurate monitoring method for public opinion information should be developed. Irrelevant information should be filtered first and then screened and reported by a professional team, and the information should be communicated to the public within the "golden 4 h" (32). This path is far from enough to rely solely on social organizations and social media. Social media and government departments must be linked.

First, we must proactively build an open and transparent government system that can review and disseminate a variety of information at the same time The interactive platform would expand the channels for collecting public opinion, and grasp the source of public opinion while establishing government credibility; second, the government needs to strengthen the study of network technology, use new media to output correct public opinion, control public opinion promptly, and support the public opinion daily. Third, the government must unite with society. The media should construct a scientific and effective public opinion dissemination system and path, to achieve timely and effective public opinion support and control; Finally, While social media is developing, because of its openness and public nature, it can also be more prone to rumors that can lead to or deepen psychological problems, and "the internet is not a place outside the law", therefore, we must strengthen the construction of the legal system, restrict the people's excessive behavior and extreme practices by law, and clarify the scope of the law.

The funding assistance strategy is the financial guarantee in social work practice. There is always a government-funded budget to solve social problems such as psychological harm. The government budget has its limitations and *blind* spots. Therefore, seeking the support of charities to assist with the development of new strategies in treating the psychological injury is an option.

Fund Assistance to Purchase Social Services From More Social Organizations

Financial assistance from charities to purchase social services is the most common strategy in social work (33). Before implementation of the social media project, the foundation will be appraised of policies for government-supported projects and expand the scope of services with government funds. Social workers understand the status of psychological injury. They can communicate and cooperate with clients and introduce the content of the project. The foundation will also directly contact social organizations to investigate the actual conditions of specific groups with psychological injuries. After collecting data, a service plan will be developed to provide financial support to social workers and help them establish professional relationships to

complete services. Throughout the process, the government will formulate policies and provide support while the foundation will improve the supply of funds and services, organize the entire project, and promote social work organizations to improve professional capabilities, thereby forming a relatively complete and efficient social service for psychological injuries.

Funding Assistance to Supplement the Government's *Blind Spot*

The government is a management department with a relatively low tolerance for faults, and grassroots workers will not easily accept social organizations, so the cooperation between the foundation and the government will be limited. At the same time, in underdeveloped areas, the incubation and cultivation of social organizations are lacking. When the training provided by the government is insufficient, the foundation can provide more training. Fortunately, at present, foundations with public offerings have been able to provide high-quality social organization training. Training also takes advantage of social media by adopting multiple online and offline modes to provide training services for various organizations and groups of people. For the development of projects in the field of mental health, professionals are more important than materials. Therefore, the foundation actively cultivates professional personnel so that social workers trained in this process can be carried out services, thereby maximizing the efficiency of the foundation's financial assistance.

Funding Assistance for Activating Social Media Marketing Plans

Since the traditional social work therapy method for psychological injuries is not as effective as expected, social media support must be an alternative. However, social media marketing is not easy, and it requires funding. In present social work practice, there is no specific financial arrangement on the widely organized social media program. A social media support plan is a strategy of social marketing, and it will operate like product marketing and promotion in the business (34). Therefore, there must be a specific organization to deal with the social media plan, which will involve recruiting professional staff to devise the social media strategy and cultivating a team of social media opinion leaders to deal with different issues concerning psychological injury. In other words, social media marketing plans and actions will incur considerable economic costs, and we must find more charity funds to invest in this work.

Funding Assistance to Establish a New Mechanism of Social Work for Psychological Injury

Traditional solutions to help those with psychological injury in social work still work and also need funds from the government and private foundations. Social media support is an additional strategy that is necessary and effective in the internet age. Charitable funds can take advantage of operational efficiency to initiate the new social media support program. Once the social media support program is operational, it can attract

the participation and cooperation of governments and local social organizations. Funding assistance can act as an engine to activate social organizations, government, social workers, and charitable foundations. Therefore, a new comprehensive solution can be initiated to assist the social media support program and traditional strategies in social work. In this way, we would develop social collaboration to promote psychological health in a vulnerable and anxious society (35).

CONCLUSION

There are still limitations of the social media support strategy and funding assistance in actual social life and operational processes. Public opinion control has the characteristics of far-reaching spread, strong appeal, and flexible methods, but the power of public opinion control and support has certain limitations, and public opinion support also has many unavoidable defects. The first is the unpredictability of the online public opinion problem. It is difficult to filter out public opinion keywords from the huge amount of information; the second is that the number of people participating in media rumors is too large, and it is difficult to balance the correct public opinion direction and the best time in the process to dispel rumors; Third, netizens tend to be younger and less disciplined, creating a large number of participants in cyberspace, information explosions, and management difficulties. Especially for children and young netizens with immature cognitive skills, there may be great harm caused by the internet when information cannot be relied upon. Education about the online environment is improving. However, the conflict of public opinion will increase the conflict of values. Finally, internet populism will weaken the authority of the government and the elite. Young and less educated people rely on intuition and habits to judge things and often have extreme concepts. In addition, they usually have a skeptical and negative attitude toward the government (36).

Foundations provide strong financial support for social projects, which is one of the powerful driving forces behind social progress. However, there are still many problems in the development of foundation projects. The first is that the current situation of social mentality is not optimistic. There are a small number of professional teams that can directly and efficiently carry out social services and operate well in public welfare programs. Therefore, charitable funds face hard choices and have less interest in assisting social work programs. Second, the budget from government funds is always enough to cover more social work programs, especially social media strategies. Therefore, there is a large funding gap for conducting large-scale social media marketing strategies in the internet society. Finally, charitable fund management has challenges. There are still many doubts about the credibility of foundations because of low transparency and negative publicity.

In conclusion, it is urgent to help individuals with psychological injury in social work since we are constructing a "people-centered society" in a new period of history. Although there are problems, we should deal with this issue through innovation both in policy and practice. On the whole, we

should continuously encourage traditional social work strategies, but we can take measures from a macro perspective of social media support programs to help those with psychological injuries in the internet age. Furthermore, we should create new opportunities for the growth of charitable foundations and their funds to assist more traditional social work programs as well as the new social media support plan. We believe that social media support and funding assistance for treating psychological injuries in social work can move forward in modern China.

IMPORTANT TERMS EXPLAINED

In the Chinese context, people often negatively define rumors, emphasizing that rumors are intentionally created information with a specific purpose and direction, while the meaning of "rumor" in the English context is not all those information that is created out of nothing or fabricated out of thin air (37). The French scholar Cap Ferré has given a neutral definition of rumor: "A rumor is a piece of information that appears and circulates in society without official public confirmation or has been officially disproved" (38).

Based on the need for research, the authors of this paper, drawing on the value-neutral position of Capulet on rumors and taking into account the actual diversity of information on social media platforms, expand the scope of rumors and define them as unofficially confirmed information that is widely spread on social media platforms in the form of modern online media and has a psychological and life impact on viewers. In this paper, we define "rumor" as an unconfirmed narrative about certain people, groups, events, and institutions that are widely spread on social media platforms in a modern online media format and have a psychological and life impact on viewers (39).

A foundation, also known as a charitable foundation, is a non-profit legal entity established following the regulations to engage in public welfare through the use of property donated by natural persons, legal entities, or other organizations (40).

DATA AVAILABILITY STATEMENT

The original contributions presented in the study are included in the article, further inquiries can be directed to the corresponding author.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by IRB of NJU (No: NJUPSY202105003). The Ethics Committee waived the requirement of written informed consent for participation.

AUTHOR CONTRIBUTIONS

XH has designed the logic of the paper and put forward the new mechanism of the social media support strategy.

CT has finished the literature review job. DW has made the proof writing job and given much suggestive advice to the paper. All authors contributed to the article and approved the submitted version.

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Burnout and Its Antecedents: Considering Both Work and Household Time Claims, and Flexibility in Relation to Burnout

Shuanglong Li[1]*, Jannes ten Berge[2] and Marcus H. Kristiansen[3]

[1] Department of Sociology, School of Public Administration, Guangzhou University, Guangzhou, China, [2] Erasmus School of Social and Behavioural Sciences, Erasmus University Rotterdam, Rotterdam, Netherlands, [3] Norwegain Tax Authority, Oslo, Norway

This study contributes to the previous literature by examining how flexible work arrangements interact with work and family time claims to affect burnout. It does so by providing a theoretical framework and empirical test of the interaction of flexibility with the effect of work and family time claims on burnout. Hypotheses and predictions based on previous literature are tested by Ordinary Least Squared regression models using data from the Time Competition Survey, constituting a sample of 1,058 employees of 89 function groups within 30 organizations. We found no main effects of work and family time claims or flexible work arrangements on burnout. However, the results do show an interaction of flexible working hours with the effect of work and family time claims on burnout. Specifically, the higher an individual's work and family time claims, the more this person benefits from having flexible working hours. In general, the results support the proposition that the relationship between work and family time claims and burnout differs for individuals with different levels of flexible work arrangements.

Keywords: burnout, work and family time claims, flexibility, moderation effect, the Netherlands

INTRODUCTION

The recent decades have witnessed significant changes in labor market conditions and increased precariousness of employment relations. For example, there has been a rise in non-standard employment in developed countries such as part-time work, temporary work, contract work, and gig economy work (1). Previous research has attributed the changed employment relations to a variety of social-economic and cultural factors such as the rise of neoliberalism economic policies, rapid technological advances, and increased ethnic and gender diversity in the labor market (1–3). These non-standard forms of employment are associated with not only low payment, but also with unpredictable work schedules, low collective voice, and employees' poor health and wellbeing (4, 5).

In this context, burnout is a common problem among the employees in today's work organizations (6–9). For example, between 2007 and 2011, the Dutch working force that reported burnout complaints grew from 11 to 13% [CBS (10)]. In the scientific literature, the term burnout was first introduced by the psychotherapist Herbert Freudenberger (11), and ever since the antecedents and consequences of burnout have received much scholarly attention from several social science disciplines [Refer to (12) for an overview]. The concept of burnout may be defined as a state of emotional, physical, and mental exhaustion resulting from occupational stress (13)

and is associated with many work-related outcomes, such as extreme exhaustion, detachment from the job, a lack of accomplishment, cynicism, and may also have a negative spillover on co-workers (12, 14). Moreover, burnout is related to mental health problems, such as anxiety, depression, and drops in self-esteem, although the causal direction of this relationship remains unclear (12, 13).

Turning to the antecedents of burnout, one of the main topics of study is how the competing time claims from work (15, 16) and household domains (17, 18) relate to burnout [e.g., (12, 19, 20) for a review]. One of the reasons for this interest is the argued rise in the problem of balancing the time claims from both work and household (21), as a consequence of the increase of single-parent households and dual-earner families (14, 22, 23). That is, families have been moving away from a more "traditional" division of labor between spouses, in which the husband provides the income and the wife takes care of the household and leads individuals to occupy roles both within the household and work sphere. The difficulties that may occur in combining several roles have been related to burnout (24). In particular, this notion is found within the role conflict theory, which asserts that combining and fulfilling several roles causes strain that in turn leads to higher levels of burnout (16, 17, 24–27). On the contrary, the enrichment approach highlights that occupying multiple roles may provide resources for the individual, alleviating burnout (17, 24, 28, 29). Considering the above, it is not readily apparent from the literature whether high work and household time claims lead to lower or higher levels of burnout.

To accommodate employees' fulfillment of both work and family roles, several family-supportive policies, e.g., parental leave, part-time work, and child care facilities, have been implemented (22). In relation to work and family time claims and burnout or related outcomes, two arrangements, in particular, have been studied, such as flexible work schedules (i.e., flextime) and working from home (i.e., flexplace) (30, 31). However, in explaining this relationship, only few studies conceptualize the relation between flexibility and burnout as an interaction with the work and household spheres (30, 32). Moreover, the one study that tests the interaction between time claims and flexibility (30) only has measures for family time claims and employs affective stress as the outcome variable.

In the present study, we aim to contribute to the existing literature by addressing the shortcomings mentioned earlier and examining how flexibility and work and household time claims interact to affect burnout. First, we establish the theoretical link between work and household time claims and burnout. Then flexibility is introduced as a moderator of this relationship, providing a coherent conceptualization of the role of flexibility in explaining burnout. Second, we proceed by addressing the shortage of empirical testing regarding the interaction of flexibility with the effect of work and family time claims on burnout. This is accomplished by including the interaction in our empirical analysis. An additional advantage of the present study and making the former contributions possible is using a unique large-scale dataset from the Netherlands. This dataset, the Time Competition Survey (33), contains detailed information

on employees' work and family characteristics from 30 different organizations. Particularly relevant for the study of time claims is the time diary measure of hours spent at work and performing various tasks in the household. The former contributions are summarized in the following research question: How is the effect of work and family time claims on burnout moderated by flexibility?

THEORIES AND HYPOTHESES

This article is organized as follows. First, an overview of the theories and empirical findings on the effect of work and family time claims on burnout. Second, the theories and findings regarding the effect of flexible work arrangements on burnout are introduced. Based on these theories and empirical findings, we predict the moderating effect of flexible work arrangements on the effect of work and family time claims on burnout. **Figure 1** shows the corresponding theoretical model.

Work and Family Roles and Burnout: Competing Hypotheses
Role Conflict Theory
In theorizing on the relationship between work and family time claims and burnout, two theories are relevant: the role conflict and the role enrichment theories (24, 27, 29). As stated above, role conflict theory and the enrichment approach arrive at different predictions. However, the two theories have in common that the individual has to fulfill different roles in the work and family spheres. The number of roles may differ between individuals and ranges from employee and coworker in the work-sphere to husband/wife, parent, and single in the family or household-sphere. It is in combining these roles from both spheres, or even within each sphere, that the two theories diverge.

Conflict theory is based on the assumption that time and energy are limited resources. For example, spending time in one sphere, the family implies less time spent in other spheres, such as work. Consequently, combining the demands pertaining to the different roles may prove conflicting. The strain caused by this conflict then causes low levels of psychological wellbeing (24, 26). Similarly, conflict theory can be used to predict burnout. When both the work and family roles pose high time claims on the individual, the combination of multiple roles becomes more complex, consequently increasing the likelihood of a person experiencing high levels of burnout. Empirical studies have shown that high work and family time claims lead to higher levels of burnout (16–18, 25, 32). Specifically, the total number of hours worked, including overtime and work pressure, is positively related to burnout and poor mental health (16, 17, 34, 35). Regarding the household, the number of children, performing household chores, and having young children are all positively related to burnout (17). The indicators of work and family time claim this study focuses on are the total of hours spent working and the total of hours spent on household chores and childcare. The impact on burnout may be particularly strong for those with traditional gender role ideology (36, 37).

FIGURE 1 | The effect of work and family time claims on burnout and the moderating effect of flexibility.
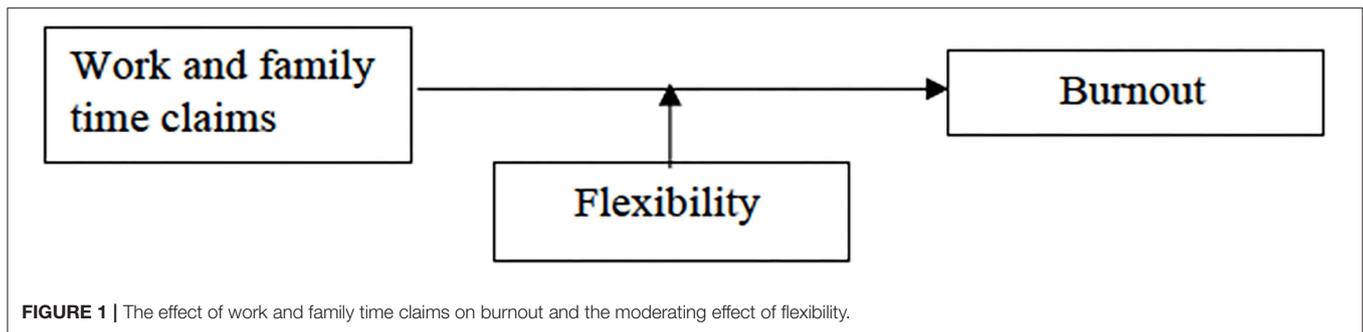
Enrichment Theory

As a response to the conflict theory, the enrichment approach has been proposed (24, 29). The rationale behind this approach is that having multiple roles "enriches" or aids an individual in combining the multitude of roles they occupy. Specifically, as opposed to the conflict theory, it is argued that having a variety of roles is beneficial to the individual, and what is perceived as demand in conflict theory is perceived as a resource in the enrichment approach. Following (17), there are three mechanisms by which the multiple roles may benefit the individual. First, the social support an individual may receive from the family is beneficial to the individual. Second, participating in family life may in itself be rewarding and fulfilling. More specifically, this fulfillment may function as a counterbalance for strains related to long working hours or the fulfillment of multiple roles. Third, engaging in family life may lead to developing new skills and knowledge that the individual may apply and benefit from when at work and vice versa. As mentioned above, the extent to which each of the mechanisms has an effect may depend on the actual time spent in each of the spheres in which one occupies a role. For example, Van Dyne et al. (38), on the social support one may receive from colleagues, argue that less overall contact reduces social support.

Following the different arguments from role conflict theory and enrichment theory, we make the following competing hypotheses:

H1a (role conflict theory): The higher the total hours spent working, the higher the level of burnout.
H1b (role conflict theory): The higher the total hours spent in the household, the higher the level of burnout.
H2a (enrichment theory): The higher the total hours spent working, the lower the level of burnout.
H2b (enrichment theory): The higher the total hours spent in the household, the lower the level of burnout.

Flexibility, Burnout, and Moderation

Whether and to what degree work and family time claims affect burnout may depend on contextual factors; among others, burnout has been one of the incentives for implementing flexible work arrangements on the organizational level (22). Much research has been done on the effect of flexible work arrangements on outcomes related to burnout, such as stress and time pressure. Despite the literature providing theoretical

reasons to suspect a moderating role of flexibility in the work and household time claims and burnout relation, only one study explicitly draws on these arguments in studying this mechanism (30). We elaborate on these theoretical arguments in the following.

The literature is not univocal concerning exactly how flexibility may affect this link between family and work time claims and burnout. One line of argumentation states that flexible work arrangements lead to an increase in the pressure or stress resulting from work and family time claims [e.g., (12, 14, 24, 27)], whereas another line of argumentation states the opposite [e.g., (30, 32)].

First, stemming from the work-family border theory, one line of argument theorizes that flexible work arrangements increase the pressure and stress resulting from work and family demands (39). Based on the concept of role blurring, the argument put forward is that flexible work arrangements threaten a clear distinction between the work sphere and the family sphere (24, 40). For example, teleworking makes working at home possible, decreasing the physical boundaries between being at work and being at home. The result of which is a blurring of roles, causing work and family duties to converge such that individuals perform both simultaneously. The increased distractions and interruptions across tasks from the two domains caused by this multitasking are likely to increase stress and conflict (27). Although Voydanoff (27) finds that regularly doing work at home is not related to work and family conflict and perceived stress, bringing work home is related to work and family conflict and perceived stress, and receiving job contacts at home is connected to work and family conflict.

Furthermore, as shown earlier, enrichment theory argues that fulfilling roles in multiple spheres provide the individual with valuable resources, such as social support, fulfillment, and new skills and knowledge. Moreover, reaping the benefits of these resources may reduce burnout complaints (24, 29). One of these resources consists of the social support one may receive from interaction with colleagues. Focusing on the relationship between flexibility and collegiality, some researchers argue that flexible work arrangements decrease the social support employees receive from their colleagues (14). The central notion of this statement is that for an individual to develop a bond with colleagues that constitutes actual support and fulfillment, the interaction between employee and co-worker is required. Flexible work arrangements, then, are argued to decrease the opportunities for

such interaction: flexible working hours reduce the chance that employers work the same hours, and telecommuting is claimed to reduce the overall time spent at work (28). This reduction in overall contact leads to less collegiality, consequently decreasing the supportive benefits associated with the role occupied in the work sphere. Research confirms the negative effect of working flexible work hours on collegiality (14). Telecommuting, however, is not found to have a negative relationship with collegiality (14).

In total, the former lines of argumentation provide theoretical grounds for the prediction that through an interaction with the effect of work and family time claims on burnout, people that use flexible working arrangements will experience higher levels of burnout. Role blurring has been related to stress and feelings of pressure (27). Since these are aspects of burnout, we may assume that a similar interaction of flexible work arrangements on the effect of work and family time claims on burnout will be found. Moreover, with regard to the theory regarding collegial social support, the reduction in social support is associated with an increase in the likelihood of burnout complaints (12). Thus, we can formulate the following hypotheses depending on our hypotheses about the effects of housework and paid work on burnout:

> H3a: If the long hours of housework and paid work increase burnout, such effects are more pronounced among employees who use flexible work arrangements.
> H3b: If the long hours of housework and paid work decrease burnout, such effects are less pronounced among employees who use flexible work arrangements.

Second, arguing in the opposite direction, many scholars state that flexible work arrangements interact negatively with the effect of work and family time claims on stress and pressure [Refer to (23, 41) for a meta-analytic overview]. The central idea behind this line of argument is that flexible work arrangements are regarded as resources at the workplace and provide opportunities for improving the management of work and family time claims (32, 42–44). Whether workload "causes" burnout is contingent on the degree to which combining work with responsibilities within the household, i.e., the family role, poses difficulties (24). Flexible work arrangements provide the opportunities needed to effectively manage work and family time claims, subsequently facilitating the fulfillment of multiple roles. For example, dividing tasks, like taking the kids to school, is more accessible when the work schedule can be adjusted to meet these requirements.

In summary, the former line of argumentation provides theoretical grounds for the prediction that through interaction with the effect of work and family time claims on burnout, people that use flexible working arrangements will experience lower levels of burnout. This provides us with competing expectations as to how flexibility may moderate the link between work and family time claims and burnout. In the following, these competing predictions will be empirically tested. Thus, we can formulate the following hypotheses depending on our hypotheses about the effects of housework and paid work on burnout:

> H3c: If the long hours of housework and paid work increase burnout, such effects are less pronounced among employees who use flexible work arrangements.
> H3d: If the long hours of housework and paid work decrease burnout, such effects are more pronounced among employees who use flexible work arrangements.

METHODS

Data

The data are taken from the Time Competition Survey conducted in 2003 among employees at 30 Dutch firms. The purpose of the survey was to study the causes of and solutions to work-home interference (33). The type of industries covered was representative of the Dutch economy, although the service sector was somewhat overrepresented. Large organizations were also over-sampled. Home interviews were conducted with 1,114 employees and, where possible, with their partners, resulting in a response rate of 28%. Of the 3,970 employees contacted, 39% agreed to participate. Each employee was subsequently contacted at home to make an appointment for the home interview. Of the employees approached at home, 28% were not interviewed in the end, usually because the partner refused to cooperate. Analyses showed that households not willing to cooperate did not differ from those willing to join the research in terms of background characteristics (e.g., gender, education, work hours) (33). As the sampling method consisted of contacting organizations and gaining access to employees through them, employees suffering long-term burnout may be underrepresented in the sample. After excluding respondents who had a missing value on one of the variables included in the analysis, we had information on 1,058 employees.

Employees were interviewed at home and were asked to answer a written questionnaire. The interview and the written questionnaire consisted of closed questions about the respondents' family situation and work characteristics. The interviews at home lasted an average of 90 min for couples and 1 h for singles. In addition, respondents filled in a time diary during the week before the interview reporting how many hours they spent cooking, cleaning, childcare, sleeping, leisure time in groups, commuting, and working. Respondents were instructed to report how much time they had spent on each activity every evening in hours. All variables are taken from the oral interview and the time diary, except the burnout items taken from the written questionnaire, and both singles and parents are considered.

Measures
Dependent Variable: Burnout
We operationalized burnout as emotional exhaustion, as this is considered the main, dominant, and most significant dimension of burnout (45). Three items measured burnout: "I feel used up at the end of the working day," "I feel mentally exhausted because of my job," and "I feel tired when I get up on a working day" (answer categories ranged from 1 = daily to 7 = never). A reversed scale

was constructed from the mean of the three items, where higher scores on the scale indicate higher levels of burnout. The scale's reliability was high (Cronbach's α = 0.86). Further analysis shows that the distribution of the dependent variable is generally normal and is only slightly right-skewed (skewness = 0.3).

Work and Household Time

Household time was operationalized as hours spent on household chores and childcare per week. Respondents reported how many hours they spent buying groceries, cooking, tidying up, cleaning, keeping household accounts, doing repairs, taking care of children, and accompanying children. Work time was measured in the total number of hours worked per week. Both variables contain hours reported in the time diary, but as the time diary had missing values ($n = 1,007$), the non-time diary, estimated hours spent on the same tasks per week was used instead. We also adjusted extreme values, more than the total hours in a week, on time spent in the household for 5 cases by replacing the time diary estimate with the asked, retrospective question on time use. This was not available for one case, and here the mean time spent in the household for parents was imputed. It should be noted that although actual housework hours and work hours are highly related to family and work time claims, they may be different in subtle dimensions that are worth further investigation in future research.

Moderator: Flexibility

We include two indicators of flexibility: flextime and flexplace. Flextime is measured with one Likert item ranging from 1 to 5, based on "I can control when I start and get off from work," with higher scores indicating higher flextime. We also measured flexplace using one 5-point Likert item, where respondents were asked "to what extent the employee would be able to work from home". The limited research that addresses the perceived vs. actual use of flexible work arrangements in explaining burnout finds that the perceived measures are a stronger predictor of burnout [refer to (46):351, for a discussion)]. Although flexible time and flexible place have been widely studied separately, this study includes both variables in the model to examine the net effect of each flexible working arrangement.

Control Variables

Family Characteristics

We measured family characteristics by two indicators: the presence of a partner and a categorical variable for children. The presence of a partner was operationalized as employees who were married or living together with a partner, coded 1; others were coded 0. Having a partner has been associated with lower levels of burnout (12, 31). To account for the presence of a child, we entered a categorical variable coded 1 if there is a child younger than 6 in the household, coded 2 if the children in the household are older than 6, keeping those without a child and no children in the household as a reference category. The presence of a young child in the household has been associated with higher levels of burnout (17).

Demographic Characteristics

Gender was entered as a dummy variable, 0 (men) and 1 (women). Age was measured in years as a continuous variable. Respondent's education was measured on an 11-point scale ranging from 1 (not completed any education) to 11 (completed a Ph.D. degree). The direction and effect of these variables have not been univocal in the empirical studies of burnout, yet it is arguably necessary to control for these demographic features (12, 17, 30).

Work Characteristics

Work pressure was measured on a Likert scale using the three items "I always have a lot of work to do," "I must work very fast," and "I work under time pressure" (Cronbach's a = 0.743, answer categories ranging from 0 = never to 5 = daily). This variable is one of the strongest predictors of high burnout (12, 17). The supervisory position was entered as a dummy, 0 if the employee was in a staff position and 1 if in a management or supervisory position. This variable was entered to account for the different qualitative work demands pertaining to these job positions. Further analyses show that Variance Inflation Factor is below two for all variables, suggesting no multicollinearity in the model.

Data Analysis

For the analysis, we ran four OLS regression models. First, we entered a baseline model with controls only to see whether the main variables have an effect when controlled for family, work, and demographic characteristics. Second, to analyze hypotheses 1a, 1b, 2a, and 2b, work and household time were added separately to the base model. Third, we added the two flexibility variables to assess any main effect of flextime and flexplace. Finally, the interaction terms between the two time variables and the two flexibility variables were added in the fourth model to test whether and how flexibility moderates the relationship between work and household time claims and burnout. To evaluate the fit of the different models, we provide both the total R^2 and the Aikake Information Criterion (AIC), where a low AIC indicates a relatively better fit (47). As the employees are clustered in organizations, we employed a cluster correction to the regression models. The cluster correction controls for the fact that employees of one organization may be more similar to one another than employees of different organizations by adjusting the standard errors. To test the interaction effects of flexibility on the relationship between work and family time and burnout, we calculated the cross-products of work and family time with flextime and flexplace, respectively. The four variables were all centered at their means, resulting in four interaction terms. The descriptive statistics for all the variables entered in the analysis are shown in **Table 1**.

RESULTS

Table 2 presents the results of the four models of the determinants of burnout, with standard errors adjusted for clustering. In Model 1, in which only control variables are included, being in a supervisory position and being older are

Variables	Mean[a]	SD	Range
Burnout	3.33	1.43	[1, 7]
Work time[b]	35.17	11.67	[0, 68]
Household time[b]	23.52	14.59	[0, 85]
Flextime	3.87	1.42	[1, 5]
Flexplace	2.85	1.36	[1, 5]
Work Pressure	3.09	0.85	[1, 5]
Children			[0, 2]
(Ref: no child)	-	-	
Children <6 years	22.8[a]	-	
Older children	27.83[a]	-	
Partner Present	74.5[a]	-	[0, 1]
Age	40.14	9.01	[17, 62]
Education	6.99	2.19	[0, 10]
Supervisory position	40.5[a]	-	[0, 1]
Gender (Female=1)	46.7[a]	-	[0, 1]

[a]*The percentage is provided for dummy and categorical variables;* [b]*In total hours per week.*

both associated with lower levels of burnout. High work pressure is significantly related to higher burnout. We do not find any significant effect of having a young or old child relative to having no children, education, presence of a partner, and gender.

In Model 2, the number of hours involved in family and work is included. Although the total R[2] increases, the AIC increases as well (Δ: 2.53), suggesting that Model 2 does not have a better fit than the controls-only model. Moreover, the main effects of hours worked and hours spent on various tasks in the household are not significant in explaining burnout. Contrary to the expectation that time spent at work or in the family would predict burnout, either positively (H1a and H1b) or negatively (H2a and H2b), our analysis finds no significant relationship between time and burnout.

Contrary to the expectation that time spent at work or in the family would predict burnout, either positively (H1a and H1b) or negatively (H2a and H2b), our analysis finds no significant relationship between time and burnout. In Model 2, the number of hours involved in family and work is included. Although the total R2 increases, the AIC increases as well (Δ: 2.53), suggesting that Model 2 does not have a better fit than the controls-only model. Moreover, the main effects of hours worked and hours spent on various tasks in the household are not significant in explaining burnout.

Further analyses find that no significant relationship could be found even when only the time variables were used to predict burnout. Only when we did not adjust for clustering on firms could a significant relationship between work time and burnout be found (*p* < 0.05, 2-sided). However, no significant association between time in the household and burnout could be found. This suggests that work time is dependent on the firm, which is further supported by a Pearson's Chi[2] test of the cross-tabulation

Variables	M1	M2	M3	M4
Age	−0.013*	−0.014*	−0.014*	−0.013*
	(0.056)	(0.005)	(0.005)	(0.005)
Gender (Female=1)	−0.018	−0.018	−0.017	−0.012
	(0.104)	(0.099)	(0.097)	(0.095)
Education	0.024	0.024	0.029	0.027
	(0.026)	(0.028)	(0.029)	(0.028)
Supervisory Position	−0.181*	−0.186*	−0.189*	−0.193*
	(0.083)	(0.087)	(0.087)	(0.086)
Partner Present	−0.123	−0.114	−0.116	−0.130
	(0.129)	(0.138)	(0.137)	(0.140)
Children (Ref = No child)	-	-	-	-
Young child (<6)	−0.111	−0.163	−0.160	−0.105
	(0.129)	(0.148)	(0.149)	(0.142)
Older children (≥6)	−0.156	−0.177	−0.170	−0.161
	(0.127)	(0.128)	(0.130)	(0.135)
Work Pressure	0.542***	0.538***	0.537***	0.536***
	(0.049)	(0.048)	(0.049)	(0.049)
Work Time		0.003	0.003	0.002
(Hours per week)		(0.005)	(0.005)	(0.005)
Household Time		0.003	0.004	0.002
(Hours per week)		(0.004)	(0.004)	(0.003)
Flextime			0.024	0.032
			(0.028)	(0.029)
Flexplace			−0.037	−0.035
			(0.032)	(0.034)
Household Time * Flextime				−0.006*
				(0.002)
Work Time * Flextime				−0.005*
				(0.002)
Constant	2.267***	2.302***	2.281***	2.234***
	(0.374)	(0.374)	(0.391)	(0.383)
AIC	3633.541	3636.074	3638.793	3632.994
Total R[2]	0.128	0.129	0.130	0.142
Total F Statistics	19.09***	20.86***	17.63***	29.78***

1) Values for flextime, flexplace, household and work time are centered at their means; 2) Figures in parentheses are standard errors adjusted for clustering on firms; 3) *p* <0.05, ** *p* < 0.01, *** *p* < 0.001, *in a 2-sided test.*

between firms and work time: Chi[2](145) = 284.45, *p* < 0.001, 2-sided).

In Model 3, the two flexibility variables were added. The results indicate that the model fit did not improve, as the AIC was the highest among all models. Moreover, the two variables are also not significant in explaining levels of burnout. Turning to Model 4, where the interaction effects are implemented, we see that the AIC is the lowest among all four models, indicating a better fit than all the other models. However, it should be noted that as the difference between the lowest (M4) and second-lowest (M2) AIC is not larger than 4, the difference in fit is not substantial. Only the significant interactions are provided

in the table; we see that only the flextime interactions were significantly related to the number of hours spent at work and in the household ($p < 0.05$ for both). This supports hypothesis 3c that the positive impacts of housework and paid work hours on burnout are less pronounced among employees who use flexible time arrangements. To illustrate and interpret these interaction effects, we provide two figures described in the following.

Figure 2 indicates that when time spent in the household increases, low flextime is associated with a higher increase in burnout. However, when flextime is high, household time is associated with about the same level of burnout despite an increase in time spent in the household. This finding supports the notion that high flextime is associated with lower levels of burnout even when there is an increase in time spent in the household.

Figure 3 shows a similar relationship for the interaction between time at work and flextime. As the number of working hours increases, burnout increases for those with low flextime. Whereas the level of burnout remains about the same for those with high flextime, irrespective of the increase in working hours. Thus, our results suggest that high perceived flextime moderates the impact of high work time on burnout.

To ensure the robustness of the results, we have used the median burnout score as the cutpoint and recoded burnout into a binary variable with 0 indicating low burnout (lower than the median score) and 1 indicating high burnout. Additionally, then we repeated our main analyses using logistic regression models in **Supplementary Table A1** in Appendix. Overall, the results are consistent with our main findings that the higher an individual's work and family time claims, the more this person benefits from having flexible working hours. This suggests that our results are robust to alternative variable specifications.

DISCUSSION

This study aimed to study how flexible work arrangements interact with work and family time claims to affect burnout. We conclude that flexible work arrangements and work and family time claims fail to account for burnout. However, the combination of work and family time claims and flexible work arrangements does provide a substantive prediction of burnout.

First, we looked at the relationship between burnout and work and family time claims. In theorizing this relationship, we focused on arguments derived from conflict theory and the enrichment approach. Contrary to (17), we found no main effects of time claims on burnout, and our findings do not univocally support either one of these theories. However, some scholars have argued that these conflict and enrichment processes may coincide (17, 48, 49). As more time is spent on fulfilling family and work roles, according to conflict theory, friction increases, leading to higher levels of burnout. The enrichment approach then argues in the opposite direction. As more time is spent on fulfilling work and family roles, the gains an individual receives from occupying these roles increase, consequently decreasing burnout. However, if these processes co-occur, these effects might cancel each other out, which may account for the non-significant main
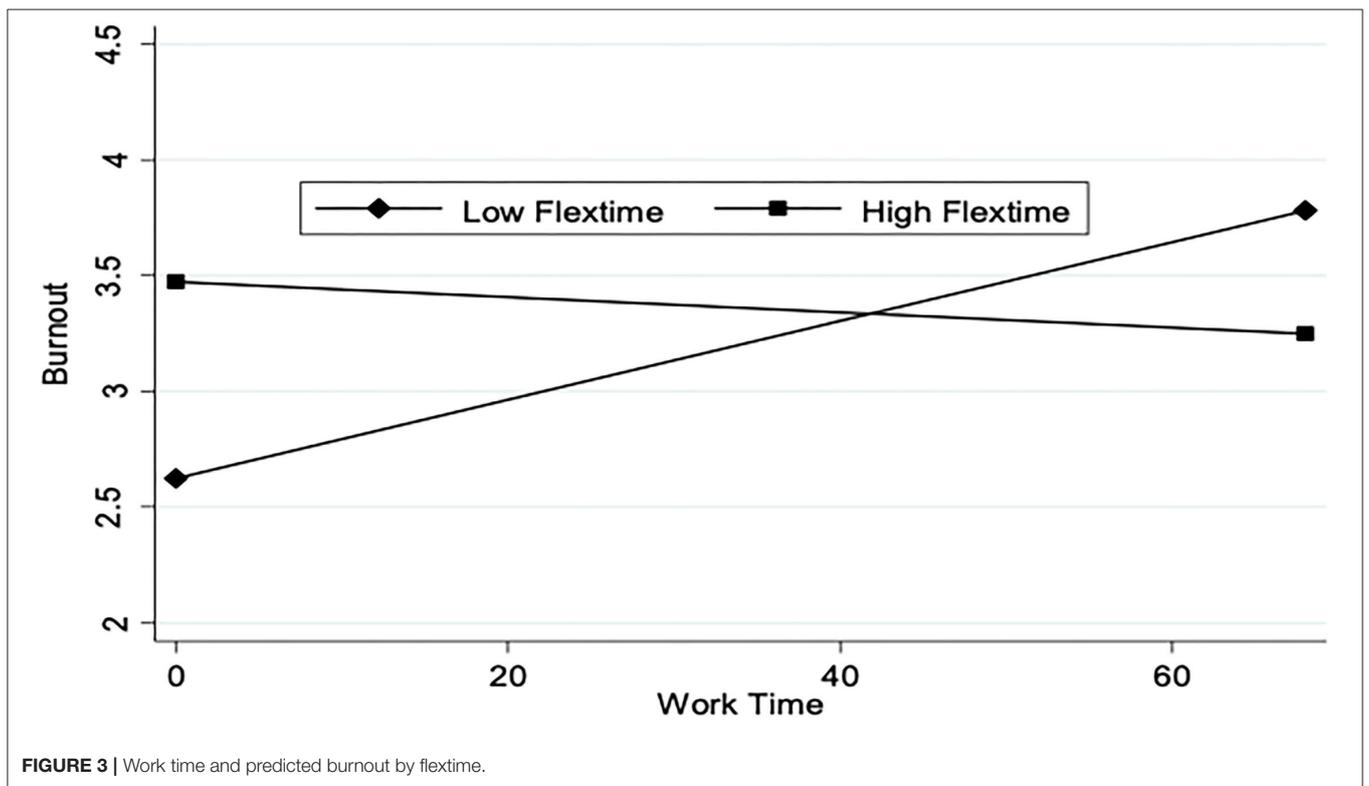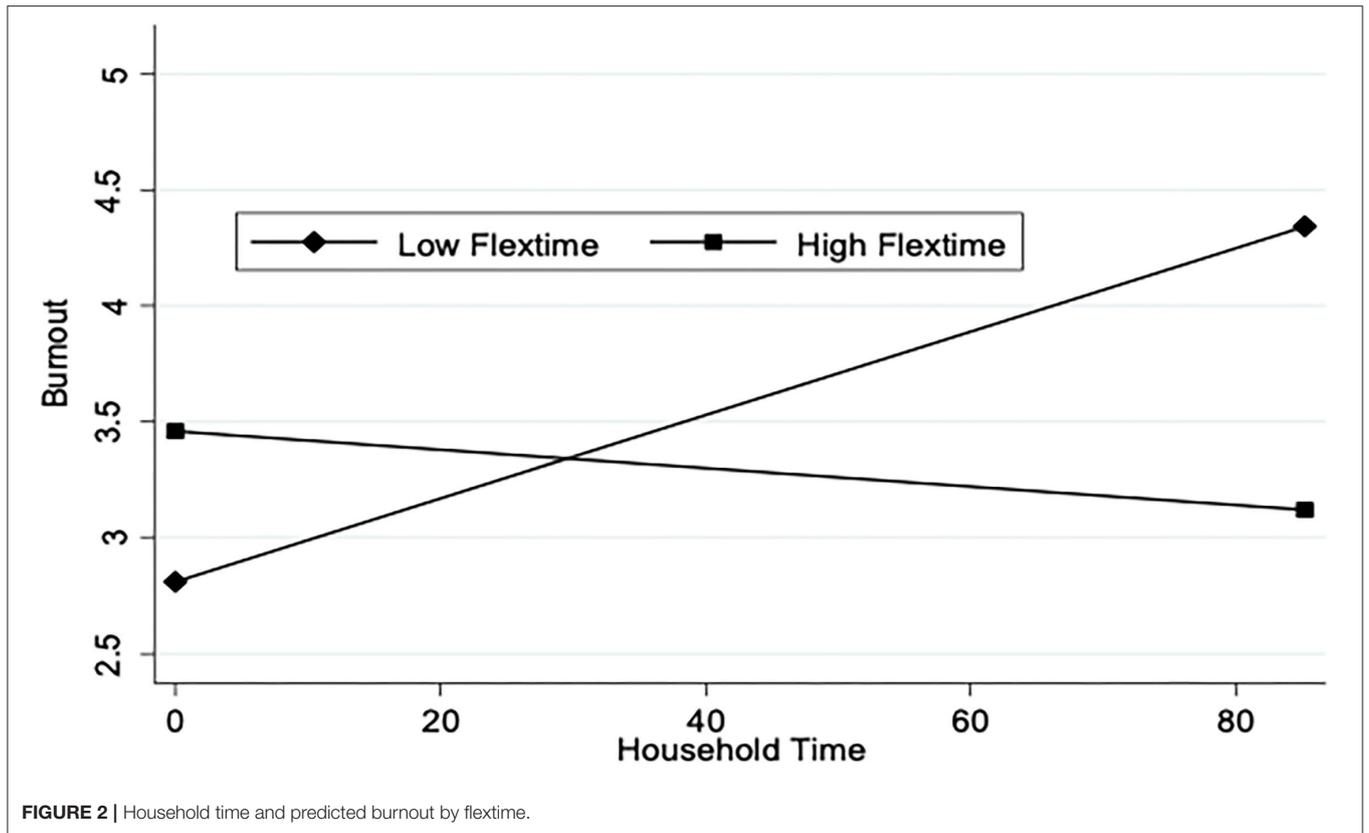
effects. Thus, although our findings do not support either of the two theories, the present study does not lead us to refute the theories either.

Second, we looked at the effect of flexible work arrangements on burnout. More specifically, we looked into how flexible work arrangements affect the relationship between work and family time claims and burnout. Burnout in the current study is not directly related to flexible working arrangements. However, the results support the predictions stemming from the time management argument that flexible work arrangements allow people to cope better with fulfilling multiple roles (23, 41). As the total hours spent in the work and family sphere increase, the more difficult a satisfactory fulfillment of these multiple roles becomes. Managing working hours, i.e., flextime alleviates these difficulties, consequently decreasing burnout. This only seems to hold for flextime, as we did not find that flexplace significantly moderated the association between work and household time claims and burnout. A possible explanation for this is that within the group of flexplace-users, we can differentiate between different sub-groups for which the effect of flexplace on burnout may differ. For example, one may argue that for those with longer commuting time, the need and impact of flexplace are more potent than for those with short commuting time. However, the inclusion of these characteristics needed to differentiate between sub-groups of flexplace-users is beyond the scope of this research. Also, previous research shows that employees who request flexible place arrangements are more likely to suffer discrimination from employers than those who request flexible time arrangements (50). The higher flexibility stigma of flexible place arrangements may help explain why they do not have moderating effects.

Limitations, Future Research, and Implications

Some limitations of the present study should be pointed out. First, as the research design is cross-sectional, no causal relationship conclusions can be drawn. Second, only the emotional exhaustion dimension of burnout is measured. Although this dimension is shown to be the main feature of burnout (45), burnout's "depersonalization" and "diminished personal accomplishment" dimensions are not addressed here. Despite these limitations, the study's strengths are that we have detailed information on both work and family variables at the employee level and the usage of a time diary to get detailed and reliable information on the actual time use of the employee (51).

One direction for future research would be to establish the exact relationship between family and work time variables and measures of flexibility and their consequent effect on burnout in a longitudinal research design. For example, one may study how high time claims from work and family affect the use of flexible work arrangements and how this may alleviate burnout. This would lead to inferences on whether and how employees manage their time between work and family and how they may employ flexible work arrangements to accommodate fulfilling multiple roles. Another avenue for future research could be to study other family-supportive policies (52), besides flextime and flexplace, and how these other policies, such as civic participation,

FIGURE 2 | Household time and predicted burnout by flextime.

FIGURE 3 | Work time and predicted burnout by flextime.

may moderate the relationship between time claims and burnout (53). In addition, although this research was conducted in the Netherlands, a developed country, the results in this study also hold significant implications for developing countries in terms of developing employee-friendly workplace policies. Future research should also pay more attention to developing countries where employees usually work long hours and do not have access to flexible working arrangements (5).

The findings of this study can be helpful in improving the effective deployment of flexible work arrangements. To maximize the gains from implementing, for example, family-friendly policies, it is crucial to know who will benefit most from a particular arrangement. Organizations that have high demands regarding time claims may want to provide more flexible work schedules to help their employees cope with combining the work time claims with those of other spheres such as the family.

In conclusion, this study contributes to the previous literature by studying the interaction of flexible work arrangements with work and family time claims on burnout. Individuals with high family and work time claims appear to benefit more from managing their working hours than those with lower time claims. It seems that when flexible work arrangements influence burnout, it is in combination with time claims and vice versa. In general, the results support the proposition that the relationship between work and family time claims and burnout differs for individuals with different levels of flexible work arrangements. The findings of this study can be helpful in improving the effective deployment of flexible work arrangements. To maximize the gains from implementing, e.g., family-friendly policies, it is crucial to know who will benefit most from a particular arrangement. Organizations that have high demands regarding time claims may want to provide more flexible work schedules to help their employees cope with combining the work time claims with those of other spheres such as the family.

DATA AVAILABILITY STATEMENT

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author/s.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by Ethics Review Board of the Faculty of Social & Behavioral Sciences, Universiteit Utrecht. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

SL designed the research and revised the paper. SL, JtB, and MHK analyzed and interpreted the data. All authors wrote the manuscript, contributed to the article, and approved the final manuscript.

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SUPPLEMENTARY MATERIAL

The Supplementary Material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fpubh.2022.863348/full#supplementary-material

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Social Integration as Mediator and Age as Moderator in Social Capital Affecting Mental Health of Internal Migrant Workers: A Multi-Group Structural Equation Modeling Approach

Jingjing Zhou[1], Jianfang Zhou[2*], Hongyang Zhang[3] and Junwei Zhang[4]

[1] School of Sociology and Population Studies, Nanjing University of Posts and Telecommunications, Nanjing, China, [2] School of Population Studies, Nanjing University of Posts and Telecommunications, Nanjing, China, [3] Department of Sociology, School of Social Sciences, Tsinghua University, Beijing, China, [4] College for Philosophy and Political Sciences, Shanghai Normal University, Shanghai, China

The rise of migrant workers has been a unique social phenomenon as China goes through industrialization, urbanization, and modernization. They are a special social group formed during the economic and social transition of the country. Migration of rural labor has pushed China on its new path toward industrialization and urbanization. Because of the urban-rural dual system of the country, however, it is difficult for migrant workers to be fully integrated into host cities, making them susceptible to negative emotions and mental health issues. Therefore, their mental health is an issue of great volume in the domains of social undertakings, people's livelihood, and public health. However, existing studies have paid limited attention to the psychological profile of migrant workers and even less to the interplays among their social capital, social integration, and mental health. Targeting China's internal migrant workers, this article tapped the interactions among their social integration, social capital, and mental health with a sample of the cross-sectional data from the China Labor Dynamics Survey (CLDS) in 2018. Multi-group structural equation modeling (SEM) was employed to test the moderating action of age by analyzing whether the mediation model differed significantly in the paths among young, middle-aged, and older migrant workers. The SEM based on bootstrapping suggested that, after controlling for the influence of gender, education, marital status, personal annual income, employer type, and self-rated health, migrant workers' social capital positively affect their mental health in a significant way, with social integration playing a mediating role. In terms of age difference, middle-aged migrant workers were more subject to the aforementioned mechanism than young ones, and young migrant workers were more affected by the mechanism than older ones.

This study revealed different psycho-social interplays among social capital, social integration, and mental health across young, middle-aged, and elderly migrant workers. The findings could serve as an important theoretical reference and as practical guidance for improving policies concerning migrant workers' mental health and social benefits in the context of economic transition.

Keywords: social capital, social integration, depression, age, migrant workers, China

INTRODUCTION

Thanks to economic globalization, international migrant workers worldwide have counted 189 million, representing the vast majority of international migrants (1). In China, there are as many as 285 million migrant workers, also known as internal migrants for work (2). They are a special social group formed in, and main contributor to, China's industrialization, urbanization, and modernization, and the rise of this class of workers is a unique social scene over the course of China's economic and social transformation (3). Generally speaking, migrant workers are workers born in rural areas, migrated to towns or cities to engage in non-agricultural work, but still have rural *hukou* or registered permanent residence (4). However, due to the segregation of cities and the countryside in China and the restrictions established by the household registration system, migrant workers can hardly obtain citizenship and the same social benefits as the locals (5). In addition, because of the large gaps in human capital and economic capital from the locals, most migrant workers are employed in the secondary labor market and live in urban fringe areas, making them susceptible to negative emotions and mental health issues (6).

Generally, personal endowment, migration distance, migration pattern, and social environment are regarded as the main factors affecting migrants' mental health (7). However, in the context of social transformation in China, frequent migration and mobility have brought about the reconstruction and transformation of such social capital as social networks and social trust of migrant workers, which directly affects their perception and digestion of negative emotions (8). In recent years, how social capital acts on mental health has been subject to extensive discussion in academic circles (9). Besides, in the absence of institutional support for citizenization and the deficiency in personal endowment of migrant workers, social capital embedded in social networks can effectively reduce the economic cost, psychological cost, and various risks in the process of migration; this helps their fusion with the local environment in economic, cultural, psychological, and identity terms (10). In the light of social capital promoting social integration, the social inclusion of migrant workers further improves their mental health by improving the sense of belonging and subjective wellbeing (11). This provides an empirical indication that social integration serves as a mediator in social capital acting on the mental health among internal migrant workers in the Chinese context (12).

In addition, large-scale migration of people from rural areas to cities for work has continued for more than 30 years in China (13). Along with social transformation and changes, the social differentiation within the migrant worker group has intensified, which is prominently manifested in the intergenerational differentiation between the elderly migrant workers (i.e., the first-generation migrant workers) and the middle-aged and young migrant workers (i.e., the new-generation migrant workers) (14). Significant differences exist among the three migrant worker subgroups when it comes to social capital, social integration, and mental health (15); however, research on the mechanism of action among migrant workers' social capital, social integration, and mental health has rarely combined with the age difference of migrant workers (16). Therefore, targeting migrant workers in China, this article gleaned the cross-sectional data from the 2018 China Labor Dynamics Survey (CLDS) to probe the links among social capital, social integration, and mental health, to examine how social integration acts as a mediator in social capital acting on mental health, and to conduct multi-group testing of age differences in the above mechanism with view to providing theoretical insight and practical guidance for improving policies concerning migrant workers' mental health and social benefits in the context of economic transformation.

LITERATURE REVIEW

Social Capital and Mental Health

Divided into individual and collective levels, social capital from an individual's perspective refers to the resources embedded in the individual's social relationship network, while collectively, it entails the trust, reciprocity, and norms within a group (17). Numerous empirical studies have proposed that for migrant workers social capital can significantly improve their mental health (18), which has been applied to mental health promotion programs (19). Using the stress process model, some scholars pointed out that social capital can alleviate perceived stress and buffer the negative impact of life events, and thereby promote mental health (20). Some scholars have noted how community-based social capital acts on the mental health, arguing that community-based cognitive social capital can promote mutual trust between migrants and local residents, eliminate the state of exclusion among floating populations, and create a good atmosphere for the community (21). However, divergence persists in academic circles about how social capital affects mental health (22). Some scholars opined that cognitive social capital (social trust, for instance) and mental health are positively correlated, but that structural social capital (social network, for instance) is not significantly correlated with mental health (23).

Social Capital and Social Integration

Social integration or inclusion is an interactive and multi-dimensional dynamic process. Social capital can help migrant workers obtain resources from social networks that deliver instrumental or emotional support, while social trust helps them to achieve physical goals (24). At present, that the social capital positively acts on the social inclusion of migrant workers has been widely discussed in academic circles (25). The positive influence of migrant workers' social capital on their social integration has been demonstrated from the perspective of resource acquisition—i.e., migrant workers obtain valuable information, social support and material assistance through social capital to promote their social integration (26). For example, Lancee (27) found that migrant workers glean recruitment information (and, thus, job opportunities) through social networks to promote their economic integration. Other scholars discussed how social capital positively acted on the inclusion of migrant workers from the aspects of culture and identity—i.e., that social networking and social participation can help migrant workers form positive social connections with local residents, promote mutual understanding, and gain a sense of belonging and identity in host cities (28). However, some scholars have pointed out that over-reliance on ascribed social relationships in social networks may result in difficulties in social inclusion (29).

Mental Health and Social Integration

In Chinese context, migrant workers' social integration or inclusion is defined as the reduction of their objective and subjective differences from urban citizens, so as to reduce the negative influence of social class inequality on mental health (30). A host of empirical studies have shown that a higher degree of social inclusion corresponds to better mental health (31, 32). Research in light of attachment theory has examined how social integration promoted mental health, finding that migrant workers with a higher degree of social inclusion enjoy a greater sense of group belonging and meaning in life, and hence lower possibility of depression (33). For example, Chen et al. (34) pointed out that migrant workers' strong attachment to the countryside may lead to lower satisfaction with their lives in the cities, but that with a higher degree of social integration, migrant workers will see their urban identity and sense of belonging significantly increase, hence better mental health. Other scholars have discussed how social integration positively acted on mental health from the viewpoint of social equality, arguing that migrant workers with a higher degree of social inclusion have a lower sense of relative deprivation, stronger sense of social equality, and better mental health (35).

Social Capital, Social Integration and Mental Health

Plenty of studies have scrutinized how social capital and social integration each acts on mental health (36, 37). For example, Steel (38) pointed out that the more trusted friends migrants have, the higher their social trust, and the better their social integration is promoted, and that this improves self-rated health. However, there is a lack of well rounded and sharply defined research and empirical explanations on the mechanism of interplay among

migrant workers' social capital, social integration and mental health. Furthermore, some scholars have posited that social capital does not necessarily positively affect mental health and its positive effect on mental health is more significant in a more harmonious social environment; this offers theoretical possibilities for discussing social inclusion to mediate the action of social capital on mental health (39). Other scholars have pointed out that to investigate how social capital affects mental health one needs to consider its applicable objects and that the perspectives of intergroup interaction and life course can help clarify the link between mental health and social capital (40).

Age Difference

At present, Western scholars pay less attention to age difference in the associations among social capital, social integration, and mental health (41, 42). Some scholars have observed based on critical reviews on migrant health research that the introduction of a life course perspective helps clarify the distribution of the effect of social determinants on health among migrant populations (43, 44). With regards to the Chinese context, some scholars have noted intergenerational differences concerning social capital, social inclusion, and mental health of migrant workers, but most of them discuss the intergenerational differences from one single dimension and from the perspective of characteristics comparison (45). In China, elderly migrant workers (that is, the first-generation migrant workers) have relatively closed and homogenous social networks, mainly generated from blood, kinship, and geographical ties in rural areas, which thus implies a stronger sense of attachment to the countryside and a lower desire to integrate into the city than that of young and middle-aged ones (46). In the meantime, compared with middle-aged and elderly migrant workers, young migrant workers have a higher perception of social integration, and thus poor social integration is more likely to lead to a decline in their mental health (47). In addition, a small number of scholars have verified the intergenerational differences in the mechanism of action on migrant workers' mental health in combination with life course theory (48, 49). These studies provide empirical support to discuss intergenerational differences in the mechanism of action among migrant workers' social capital, social integration and mental health.

Gaps in Existing Literature and Establishment of Current Hypotheses

Most of the existing research has examined how social capital and social inclusion each acts directly on the mental health for migrant workers (50, 51), or explains how social capital affects social integration among migrant workers (4). However, there has been no research offering a comprehensive exposition of the mechanism of interplay among migrant workers' social capital, social integration, and mental health. In addition, most of the existing research has discussed the intergenerational differences among migrant workers' social capital, social integration, and mental health from a single dimension (52). Whether the intensity of social capital and social integration acting on mental health differs among young, middle-aged, and elderly migrant workers has not been fully verified. Therefore, this study
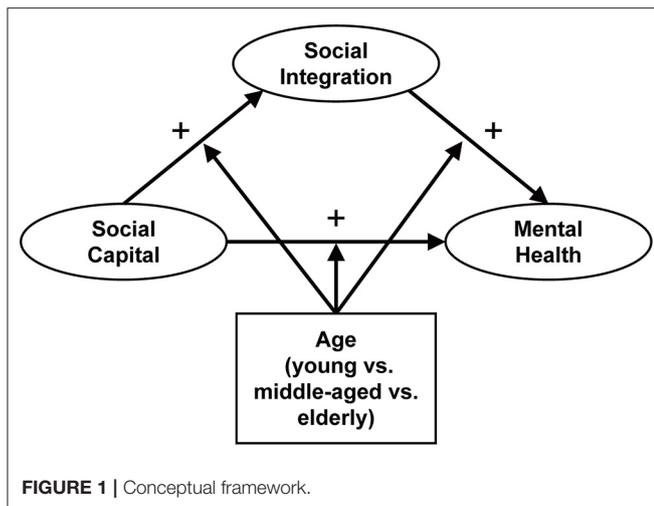
FIGURE 1 | Conceptual framework.

established a comprehensive conceptual framework to tap the interplays among social capital, social integration, and mental health status among internal migrant workers in China, as well as age differences therein (see **Figure 1**). Three core hypotheses were examined. H1: The higher the level of social capital, the better the mental health. H2: An increase in the level of social capital will improve social integration, thereby enhancing mental health. H3: How social capital acts on mental health through social integration may vary by age.

METHODS

Data

This study sourced the data from the 2018 China Labor Dynamics Survey (CLDS). A comprehensive social survey in large scale, the CLDS is designed and implemented by the Center for Social Science Survey at Sun Yat-sen University in China. It adopts a multi-stage, multi-level, and probability proportional to size of labor force sampling method, covering the labor population aged 15–64 in 29 provinces, cities, and autonomous regions across the country. The survey was officially launched in 2012 and is carried out every 2 years. The latest survey was in 2018. This study defined migrant workers as 15–64-year-old non-agricultural laborers in urban areas with an agricultural household registration (53). After removing those with missing values for key variables—accounting for 1.8% of the population- the effective sample finally consisted of 8,346 individuals.

Measures
Dependent Variable
The degree of depression was used herein to measure the mental health (54). Cai and Xu (55) questionnaire asked about the occurrence of 20 conditions in the past week: "I am troubled by some trivial stuff," "I have not appetite to eat," "Even if my family and friends help me, I still can't get rid of my depression," "I feel I'm worse than most people," "I'm depressed," "I can't concentrate when I do things," "I feel exhausted with everything," "I feel hopeless," "I think my life is a failure," "My sleep quality is bad,"

"I'm scared," "I feel unhappy," "I don't talk as much as usual," "I feel lonely," "I feel my life is boring," "I feel people are not very kind to me," "I used to cry," "I feel apprehensive," "I don't feel liked by people," and "I don't think I can go about my daily work." The frequency options were "1 = 5–7 days, 2 = 3–4 days, 3 = 1–2 days, and 4 = less than 1 day," in which higher values indicated lower degrees of depression and hence better mental health.

Independent Variable
In the research on migrant workers, scholars often use Putnam's definition of social capital (56), arguing that social capital mainly consisted three parts (network, trust, and reciprocity) and divided into two types: cognitive social capital, including trust, reciprocity, etc., which is marked by pronounced individual subjective wishes, and structural social capital, including social participation, socializing frequency and pattern, etc., which is susceptible to objective conditions (57). Therefore, social capital was measured in this study from two aspects: social trust and social network. CLDS (2018) questionnaire divided social trust from the perspective of specific objects into nine categories. They were trust in, respectively, family members, neighbors, schoolmates, fellow villagers, strangers, colleagues, vendors, and religious believers, rated by level of trust from low to high (1 = completely untrustworthy, 5 = completely trustworthy). Regarding the social network, the questionnaire includes "How often does mutual help occur between you and your neighbors and other residents of this community?" with options on an ascending scale from 1 = never to 5 = always.

Mediating Variable
To measure social integration, most studies include such dimensions as economic inclusion, acculturation, identity fusion, and psychological inclusion (58), which may vary in denotation but are similar in connotation and measures (59). The present study applied the same division of social integration for migrant workers. Among them, economic integration refers to the integration in terms of employment, income and social security (60). It was measured by self-assessment of family economic status. The questionnaire asked the following question: "Generally speaking, how do you feel about the economic status of your family?" with options in such order from low to high as 1 = very dissatisfied to 5 = very satisfied. Cultural integration refers to familiarity with the language, lifestyle, and social customs of the inflow area and the degree of participation in cultural activities (61). It was measured by dialect proficiency. The following question was asked in the questionnaire: "How well have you mastered the local dialect?" (1 = none, 2 = little, 3 = partially, 4 = mostly, 5 = totally). Psychological integration refers to the psychological judgment of the degree of satisfaction and happiness in life in a city or town (62). It was measured by subjective wellbeing, and the following question was inquired: "Overall, how happy do you think your life is?" with the level of happiness assigned with values ranging from 1 = very unhappy and 5 = very happy. Identity integration refers to one's psychological distance from locals and fellow villagers, sense of belonging, and perception of where one is going in future. It was measured by whether to settle locally. The questionnaire

asked the following question: "Are you likely to settle locally in the future?" with options in an ascending order from 1 = very unlikely to 5 = very likely).

Covariates

Seven demographic characteristics and two family elements constituted the covariates. The seven demographic variables were gender (0 = male, 1 = female); education (0 = none, 1 = primary school, 2 = junior high school, 3 = high school, 4 = bachelor's, 5 = master's); employer type: administration (0 = no, 1 = yes), enterprise or social organization (0 = no, 1 = yes), individual business (0 = no, 1 = yes), and freelance or non-regular job (0 = no, 1 = yes); and self-rated health (1 = very unhealthy, 5 = very healthy). The two family elements were marital status (0 = single, 1 = married) and personal annual income.

Analytical Approach

SPSS 23.0 was used to organize data, sort out descriptive statistics before correlation analyses. According to the research purpose, Amos24.0 was used to establish and analyze the measurement model and the structural model among variables. Such indices as chi-square (χ^2), comparative fit index (CFI), Tucker–Lewis index (TLI), root mean square error of approximation (RMSEA), and standardized residual mean square root (SRMR) were used to evaluate the goodness of the model-data fit. Specifically, non-significant chi-square values ($p > 0.05$), CFI and TLI above 0.90, and RMSEA and SRMR below 0.08 each denote a good fit (63). Bootstrapping was used to test the mediating effect (5,000 re-samples), in which the effect is deemed significant with the 95% confidence interval (CI) not including 0 (64). In addition, multi-group structural equation was used to evaluate the age difference in the overall model, in which the critical ratio of difference (CRD) was used to compare the structural path coefficients across groups. If the absolute value of the CRD is higher than 1.965, then there is an inter-group difference at the level of $p < 0.05$ (65).

RESULTS

Descriptive Statistics and Correlation Analyses

The descriptive statistical results of the demographic variables herein are show in **Table 1**. Among the 8,346 migrant workers sampled, 39.5% were aged 31–50, which means that middle-aged migrant workers represented the largest proportion of the surveyed. Slightly more male migrant workers were surveyed than female ones (54.4%); most of the participants had finished middle school (38.9%); about four-fifths were married (81.4%); and they mostly worked for enterprises or social organizations (37.2%). In terms of self-rated health, most migrant workers had a good self-assessed health status (43.6%). As seen from **Table 2**, social capital, social inclusion, and mental health were significantly positively correlated, indicating a significant correlation among the key variables involved in this study, thereby satisfying the prerequisites of the mediation effect test (66).

TABLE 1 | Descriptive statistics of variables (*N* = 8,346).

	Frequency (n) or mean	Percentage (%) or SD*
Gender		
Male	3,805	45.6%
Female	4,541	54.4%
Age		
15–30	2,042	24.5%
31–50	3,297	39.5%
51–64	3,007	36.0%
Education		
Illiterate	777	9.3%
Primary school	1,861	22.3%
Middle school	3,246	38.9%
High school	1,531	18.3%
Bachelor (junior college included)	905	10.8%
Master	26	0.3%
Marital status		
Single	1,550	18.6%
Married	6,796	81.4%
Employer type		
Administrative institutions	1,531	18.3%
Corporate or social organizations	3,104	37.2%
Individual business	1,705	20.4%
Freelance or no formal employment	2,006	24.0%
Self-rated health		
Very unhealthy	237	2.8%
Unhealthy	924	11.1%
Average	1,889	22.6%
Healthy	3,636	43.6%
Very healthy	1,660	19.9%
Personal annual income (logarithm)	10.2	0.9

*SD, standard deviation.

TABLE 2 | Correlation analyses among key variables.

	Mean	Standard deviation	1	2	3
1. Social capital	3.341	0.581	1		
2. Social integration	3.428	0.842	0.155***	1	
3. Mental health	3.552	0.518	0.198***	0.257***	1

***p < 0.001.

Measurement Model

Results from testing the scales of social capital and social integration showed that the Cronbach's alpha coefficients of social

capital and social integration were 0.706 and 0.820, respectively, both greater than 0.7, indicating a good reliability (67).

The adequacy of fit was evaluated with the confirmatory factor analysis (CFA). The model included two latent variables: social capital and social integration. Results showed a good model-data fit with chi-square = 22.749 ($p < 0.01$; $df = 8$), CFI = 0.999, and RMSEA = 0.015. All factor loadings of latent variables were significant at the $p < 0.001$ level, among which the factor loading ranges for social integration and social integration were 0.742–0.827 and 0.667–0.848, respectively. The CR values of the latent variables were 0.763 and 0.825, both >0.6, and the AVE values were 0.617 and 0.543, both >0.5, indicating acceptable convergent validity of the model. Furthermore, multi-group analyses showed that the model was invariant among migrant workers of different ages at the configural, metric, and scalar levels.

Structural Model

The structural model had the fit indices: chi-square = 191.851, df = 44, $p < 0.001$, CFI = 0.994, TLI = 0.986, and RMSEA = 0.020, indicating a good model-data fit. The full-sample model as shown in **Figure 2** and **Table 3** suggested that social capital positively acted on the mental health in a significant way ($\beta = 0.187$, $p < 0.001$)—i.e., the higher the level of social capital, the better the mental health, confirming H1. Social integration mediated in an important way the link between social capital and mental health. Specifically, improved social capital contributed to higher degrees of social integration ($\beta = 0.180$, $p < 0.001$), thereby improving mental health ($\beta = 0.208$, $p < 0.001$) among migrant workers, confirming H2.

Among the covariates, mental health was better in male migrant workers than in female ones ($\beta = -0.032$, $p < 0.01$); those with higher education levels were more mentally healthy ($\beta = 0.036$, $p < 0.01$); compared with unmarried ones, married

migrant workers had better mental health ($\beta = 0.040$, $p < 0.001$); a higher income corresponded to better mental health ($\beta = 0.044$, $p < 0.001$); better self-assessed health status indicated better mental health ($\beta = 0.145$, $p < 0.001$); migrant workers working in administrative or public institutions had better mental health than freelance or non-regularly employed ones ($\beta = 0.025$, $p < 0.05$), but other employer types had no significant correlation with the mental health. Overall, the full-sample model explained 9.2% of the variance in social integration and 14.3% of the variance in mental health status. The bootstrapping results are shown in **Table 4**. Social integration mediated the action of social capital on the mental health [$\beta = 0.037$, 95% bootstrap CI (0.03, 0.046)], accounting for 16.4% of the total effect [$\beta = 0.225$, 95%bootstrap CI (0.197, 0.252)], in which the indirect effect was indicated significant with the bootstrap 95% confidence interval not containing 0.

Group Difference Test

Multi-group analyses in SEM were conducted to verify any significant difference in path coefficients due to age. First, the measurement model was found to be invariant ($p > 0.05$)—that is, the factor loadings were equal across age groups; secondly, we compared the unconstrained structural model where the structural path changed with age with the constrained one, in which the factor loadings, covariances, weights, residuals, etc. were set equal across young workers (15–30 years old), middle-aged migrant workers (31–50 years old) and elderly migrant workers (51–64 years old). The results showed a significant difference ($p < 0.001$) between the unconstrained model ($\chi^2 = 324.563$, df = 132) and the constrained one ($\chi^2 = 682.186$, df = 178).

The CRD tests showed significant divergences across young, middle-aged, and older migrant workers in the three pathways.

FIGURE 2 | Standardized structural model (Full sample). ***$p < 0.001$.
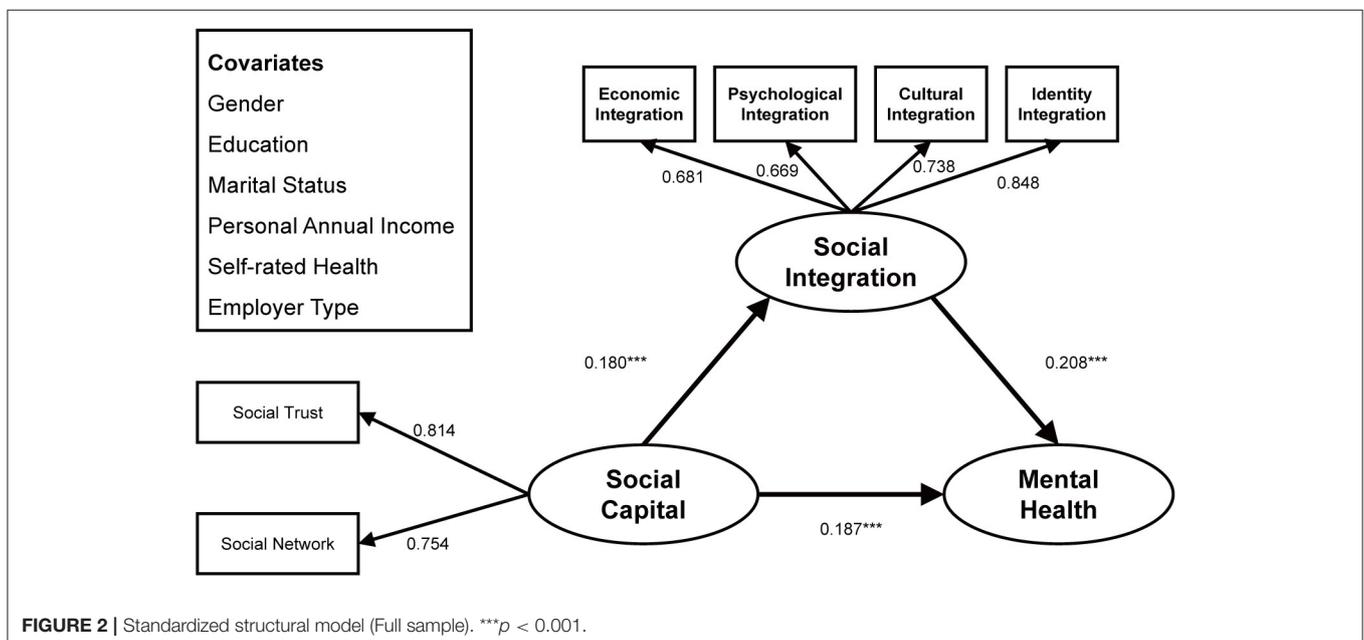
TABLE 3 | Results of structural model for full sample and subsamples.

Model paths	Full sample			15–30 years old			31–50 years old			51–64 years old		
	β	SE	CR	β	SE	CR	β	SE	CR	β	SE	CR
Social integration ←-- Social capital	0.180***	0.016	12.909	0.145***	0.036	4.992	0.268***	0.027	12.754	0.085***	0.024	3.680
Mental health ←-- Social integration	0.208***	0.009	17.136	0.203***	0.017	8.161	0.265***	0.014	14.315	0.056**	0.016	2.796
Mental health ←-- Social capital	0.187***	0.011	14.828	0.14***	0.022	5.367	0.296***	0.018	15.317	0.064**	0.016	3.169
Mental health ←-- Gender	−0.032**	0.011	−3.029	−0.015	0.02	−0.675	0.006	0.019	0.34	−0.086***	0.018	−4.696
Mental health ←-- Education	0.036**	0.005	3.105	0.055*	0.011	2.436	0.032	0.009	1.867	0.018	0.009	0.950
Mental health ←-- Marital status	0.040***	0.015	3.578	0.008	0.022	0.33	0.074***	0.04	4.648	0.017	0.081	0.980
Mental health ←-- Personal annual income	0.044***	0.006	4.142	0.041	0.011	1.864	0.074***	0.01	4.445	0.035	0.009	1.946
Mental health ←-- Self-rated health	0.145***	0.006	13.234	0.101***	0.012	4.544	0.075***	0.01	4.653	0.268***	0.008	14.771
Mental health ←-- Individual business	−0.005	0.016	−0.372	0.043	0.032	1.463	−0.01	0.027	−0.544	−0.011	0.026	−0.571
Mental health ←-- Corporate or social organizations	0.021	0.014	1.562	0.042	0.029	1.352	0.035	0.024	1.784	0.002	0.021	0.090
Mental health ←-- Administrative institutions	0.026*	0.017	2.049	0.03	0.035	1.074	0.012	0.028	0.602	0.041*	0.025	2.060

***p < 0.001, **p < 0.01, *p < 0.05; β, standardized coefficient; SE, standard error; CR, critical ratio.

TABLE 4 | Direct and indirect effects and 95% confidence intervals (CI).

Model pathways	Full sample			15–30 years old			31–50 years old			51–64 years old		
	β	95% CI		β	95% CI		β	95% CI		β	95% CI	
		Lower	Upper		Lower	Upper		Lower	Upper		Lower	Upper
Total effect												
Social capital → mental health	0.225	0.197	0.252	0.17	0.103	0.232	0.367	0.331	0.401	0.069	0.023	0.114
Direct effect												
Social capital → mental health	0.187	0.161	0.214	0.14	0.074	0.203	0.296	0.26	0.332	0.064	0.019	0.109
Indirect effect												
Social capital → social integration → mental health	0.037	0.03	0.046	0.029	0.016	0.047	0.071	0.055	0.088	0.005	0.001	0.011

β, standardized coefficient.

First, significant divergences existed between young and middle-aged subgroups, between young and elderly subgroups, and between middle-aged and elderly subgroups in the path coefficient of social capital to mental health (CRD = −5.606, $p < 0.05$, CRD = 2.423, $p < 0.001$, and CRD = 9.265, $p < 0.001$, respectively). Secondly, significant divergences were seen in the path coefficient of social capital to social integration between young and middle-aged subgroups, between young and elderly subgroups, and between middle-aged and elderly subgroups (CRD = −3.761, $p < 0.001$, CRD = 2.136, $p < 0.05$, and CRD = 7.235, $p < 0.001$, respectively). Finally, significant divergences were seen in the path coefficient of social integration to mental health between young and middle-aged subgroups, between young and elderly subgroups, and between middle-aged and elderly subgroups (CRD = −2.481, $p < 0.05$, CRD = 4.096, $p < 0.001$, and CRD = 7.179, $p < 0.001$, respectively).

As shown in **Figures 3–5** and **Table 3**, the above three structural paths had significant positive effects on young, middle-aged and elderly migrant workers, but the degree of effect varied. Specifically, on the path from social capital to mental health, the effect on the middle-aged subgroup (β = 0.296, $p < 0.001$) was more significant than that on the young subgroup (β = 0.140, $p < 0.001$), which in turn was greater than that on the elderly subgroup (β = 0.064, $p < 0.001$); on the path connecting social capital to social integration, the middle-aged subgroup (β = 0.268, $p < 0.001$) were more affected than the young subgroup (β = 0.145, $p < 0.001$), and the young subgroup was more affected than the elderly group (β = 0.085, $p < 0.001$); on the path connecting social capital to mental health, the middle-aged subgroup was more affected (β = 0.265, $p < 0.001$) than the young subgroup (β = 0.203, $p < 0.001$), who was more affected than the elderly subgroup (β = 0.056, $p < 0.001$).
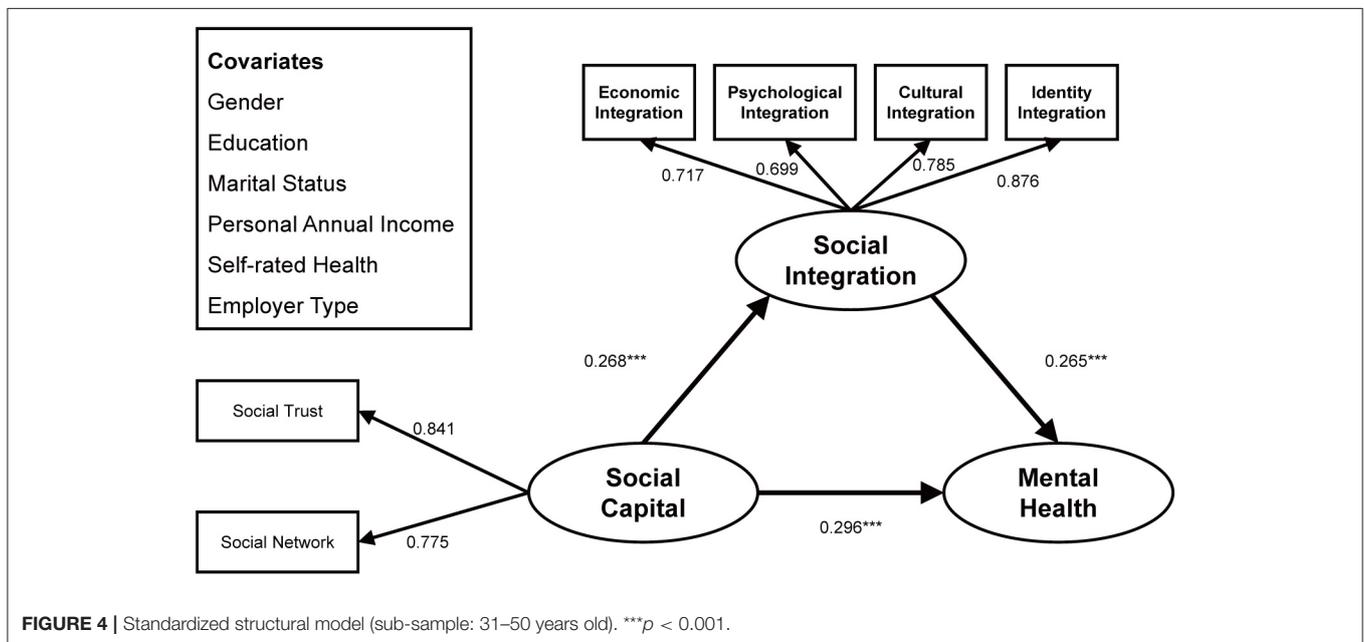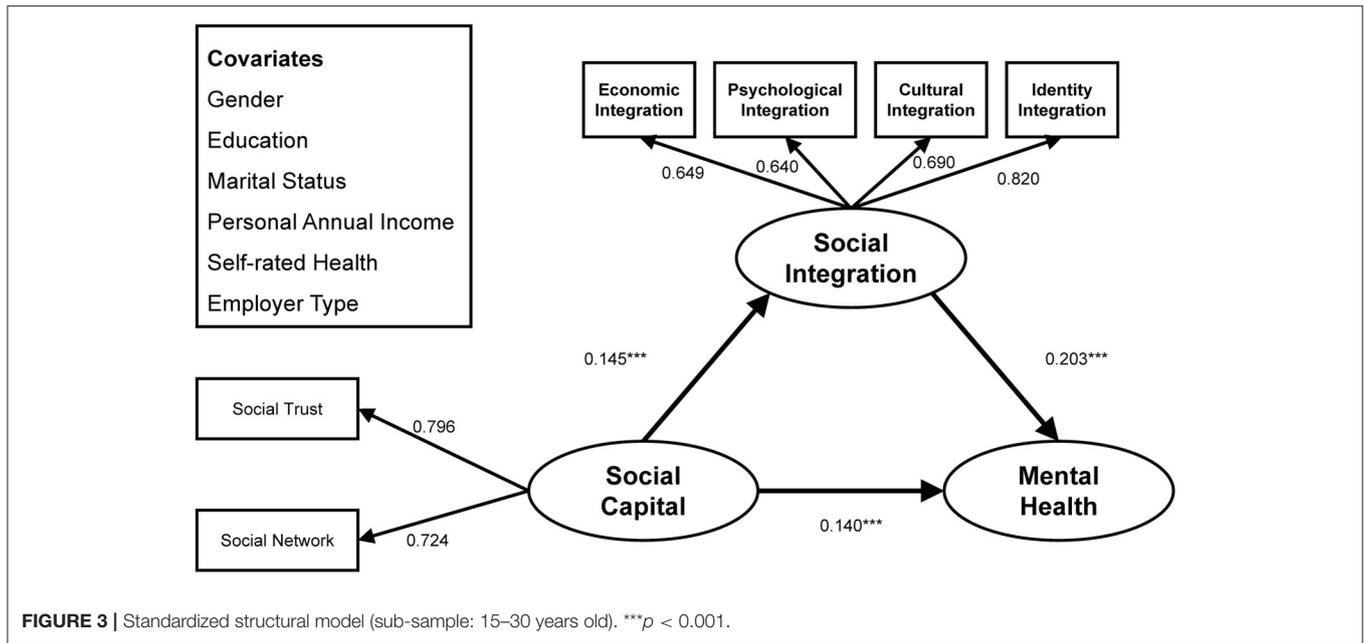
DISCUSSION

Targeting migrant workers in the context of China's social transformation, this article investigated the interplays among their social capital, social inclusion/integration, and mental health, elucidated the mechanism of social integration mediating the way social capital acts on mental health, and provided theoretical support and coping strategies for bettering migrant workers' mental health.

The results show that enhanced social capital of migrant workers could effectively improve their mental health, a finding that supported H1 and kept with previous findings. Cognitive social capital (represented by trust) and structural social capital (represented by social network) are both significantly related to health status (68, 69). For migrant workers, improved social trust helps reduce the incidence of depression, and those with higher levels of social trust are better positioned to establish harmonious interpersonal relationships, which helps relieve tension and fear in urban life, and tend to have more positive psychological expectations when facing psychological difficulties, all of which significantly enhance their mental health (70). In terms of social network, on the one hand, migrant workers improve their economic capabilities by working, which can effectively resolve

frictions and conflicts among family members, and can increase the sense of attachment between them, enhance the supportive role of the ascribed social network, and alleviate their mental pressure (71); on the other hand, the social network constructed and expanded by migrant workers in the city by working can effectively reduce the various pressures they face in the city, thereby curbing the psychological crisis (72).

Additionally, this study found that migrant workers with more social capital had a higher degree of social integration, thereby improving their mental health, which supported H2. This finding is considered an innovation in this study, which explains the interplays among social capital, social inclusion, and mental health of internal migrant workers by constructing a fresh framework. In China, where "social relations" are highly valued, social capital plays a more meaningful role than human capital (73). For migrant workers who lack both human capital and economic capital, their economic activities such as job hunting rely more on social network (74), so social capital promotes the economic inclusion of migrant workers. Besides, social capital provides an important way for migrant workers to participate in cultural activities, adapt to new urban lifestyles, and acquire a sense of identity, which supports achievement of expressive goals and enhances psychological integration and identity integration (75). On the basis that social capital promotes the improvement of social integration, social integration affects the mental health of migrant workers through health behavior influence paths, psychological influence paths, and physiological influence paths (76). For example, social integration can improve mental health by increasing individual control, sense of belonging, and generalized trust (77).

Multi-group analyses by age also provided valuable findings. The social integration-mediated action of social capital on mental health differed along age lines, a finding that supported H3. On the three paths by which social capital affected mental health, social capital affected social inclusion, and social inclusion affected mental health, middle-aged migrant workers (31–50 years old) were more affected than young migrant workers (15–30 years old), while the effect on young migrant workers exceeded that on older migrant workers (51–64 years old). Combined with the life course theory, when social changes have different effects on the cohorts of different generations, due to the obvious similarity in the experience of the same generation, the conditions of different generations tend to show significant differences, and therefore, the historical effect of life trajectories is manifested in the experiences of different generations (78). In China, the first generation of internal migrant workers (older migrant workers) emerged after the reform and opening up of the country, and the new generation (middle-aged and young migrant workers) emerged in the early 2000s. The new generation, compared with the first generation, has seen the economic and social situation undergo tremendous changes, leading to differences across the three subgroups in the mechanisms of interaction between social capital, social integration, and mental health (79). Compared with older migrant workers, middle-aged and young migrant workers generally have higher levels of education, higher occupational expectations, and more opportunities to move between urban

FIGURE 3 | Standardized structural model (sub-sample: 15–30 years old). ***p < 0.001.

FIGURE 4 | Standardized structural model (sub-sample: 31–50 years old). ***p < 0.001.

and rural areas. With greatly improved social security and labor security systems, young and middle-aged migrant workers are in better positions than the elderly migrant workers with regards to both social network and social capital such as social trust, and enjoy a higher degree of multi-dimensional social integration in economy, psychology, identity, and culture (80). Compared with young ones, middle-aged migrant workers spend a longer time in the city and have richer work and life experience, which brings them more social capital, and thus a higher degree of social integration (42). In addition, due to aging and the decline of labor capacity among elderly migrant workers, except for a very small

number of skilled and managerial talents who have become the backbone of an enterprise and thus stayed in the city, most of them have chosen to return to their hometowns to spend the rest of their lives. The lack of belonging to agricultural production and life makes young and middle-aged migrant workers eager to blend themselves with the cities and enjoy modern city life. Therefore, compared with the mental health of elderly ones, that of middle-aged and young migrant workers is more easily affected by the level of social capital and social integration (81).

This study has practical significance of value for bettering the mental health for migrant workers. The findings offer

FIGURE 5 | Standardized structural model (sub-sample: 51–64 years old). ***$p < 0.001$.
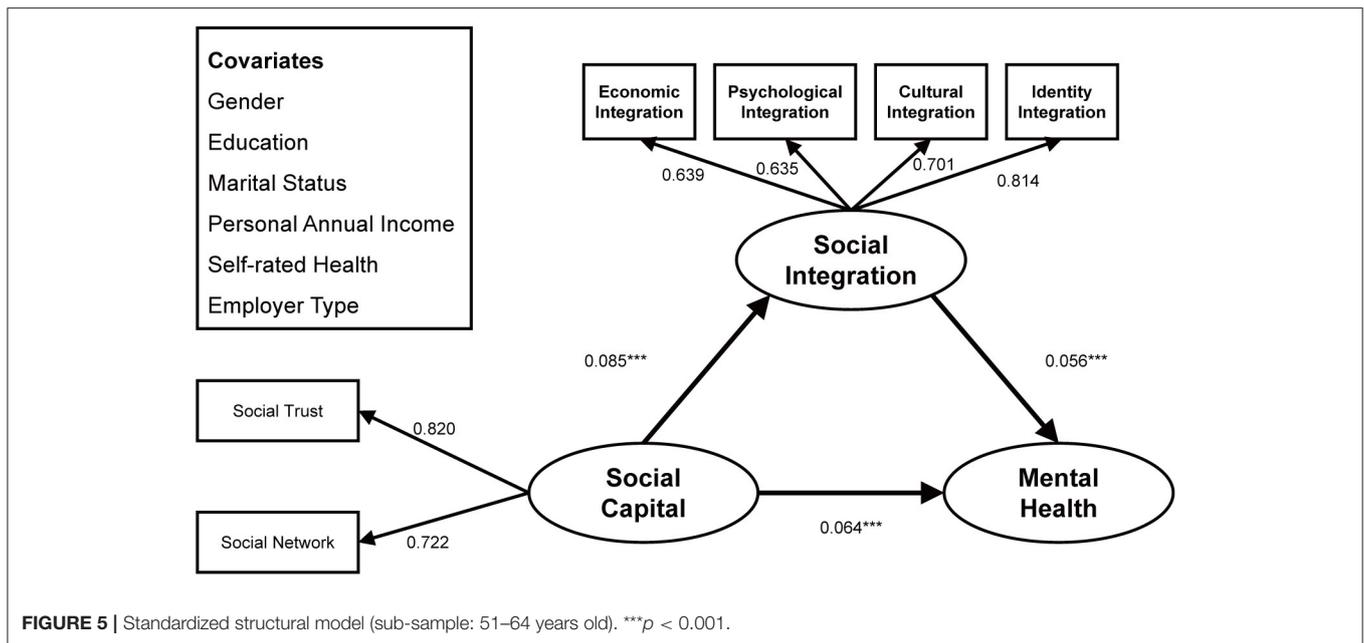
evidence supporting the government to improve the household registration system, build an integrated labor market, and establish supporting security systems such as healthcare, housing, children's education, and old-age care, providing institutional support for the social integration of young, middle-aged and elderly migrant workers and alleviate their feelings of being "marginalized" (82). On the other hand, companies where migrant workers are employed should establish mental health counseling and monitoring systems to give targeted psychological counseling and emotional regulation services for young, middle-aged, and elderly migrant workers. In pursuing work efficiency, the companies can organize employee assistance programs to elevate the human and social capital of migrant workers (83). In addition, each community should make full use of its resources, such as working with social organizations, increasing community activities, improving community conflict and dispute mediation mechanisms, etc. This would promote the acculturation and identity integration of migrant workers, help migrant workers and local residents form good social relations, and enhance the social trust, security, and happiness of migrant workers (84).

Objectively speaking, some gaps exist in the study that should be filled in follow-up research. First, although this study combined theory and SEM to tap the mechanisms of interaction between social capital, social integration, and mental health, because cross-sectional data was used, the establishment of causal relationships needs to be deepened with experimental and longitudinal design. Secondly, in addition to social integration as the mediating variable and demographical and family characteristics as the covariates selected herein, there may be other variables that play mediating roles in connecting social capital and mental health among internal migrant workers in combination with relevant literature, such as social status in subjective and objective terms, social support, etc. (85). Besides, the security status of migrant workers, such as the type of labor

contract (permanent/casual), whether they have social insurance, employment security, etc., will also affect their health status (86). Therefore, future research can include more variables to conduct diversification analysis. Thirdly, combining the inter-group differentiation among internal migrants in China, i.e., age grouping, this study explored the inter-group differences in the mechanism of action among their social capital, social integration, and mental health. In addition to age, factors such as income and gender may also cause differences in the mechanism of association among related variables (87). The follow-up research may conduct multi-group difference analysis from other perspectives. Finally, due to the limitation of data, the measurement of the health status of the sample focused on mental health and self-assessed health with little attention to objective physical measures. Although self-rated health data effectively reflects the self-perception of individual health status, and has good reliability and validity in the Chinese social environment (88), it is still affected by cognitive biases of individuals, such as "feel too good about oneself," answering biases, etc. Hence, in future research, both self-assessed and objective health indicators should be collected at the same time to ensure a holistic view of the research object and thereby arrive at more reliable conclusions.

CONCLUSION

Targeting Chinese internal migrant workers with a sample from the CLDS database, this study revealed the mechanisms of interaction between their social inclusion, social capital and mental health and verified age differences therein. The research results showed that social capital positively affected mental health in a significant manner, with social integration playing a mediating role therein; middle-aged migrant workers were more affected by the above mechanism than young migrant workers,

and the effect on young migrant workers exceeded that on the elderly migrant workers. Despite certain limitations, this study raises some intriguing questions about migrant workers in China, offering important theoretical reference and practical guidance for policies to better the mental health and social benefits for migrant workers with age considerations in the context of economic transition.

DATA AVAILABILITY STATEMENT

The data underlying the results presented in the study are available from the China Labor-force Dynamics Survey (CLDS). Anyone can access through application with the Center for Social Survey at Sun Yat-sen University at http://isg.sysu.edu.cn/node/425.

AUTHOR CONTRIBUTIONS

JinZ and JiaZ designed the model and the research frame work and wrote the manuscript. HZ contributed to the data preparation. JZha helped with the revision of literature review. All authors contributed to the article and approved the submitted version.

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Transformation to Industrial Artificial Intelligence and Workers' Mental Health: Evidence From China

Siying Yang[1,2], Kouming Liu[3], JiaHui Gai[3] and Xiaogang He[3]*

[1] Centre for China Public Sector Economy Research, Jilin University, Changchun, China, [2] School of Economics, Jilin University, Changchun, China, [3] Institute of Industrial Economics, Jiangxi University of Finance and Economics, Nanchang, China

This study matches data from the China Family Panel Studies (CFPS) with data on the transformation to industrial artificial intelligence (AI) in cities to explore the effect of this transformation on workers' mental health and its underlying mechanisms in China. The findings show the following (1). The transformation to industrial AI effectively alleviates multiple mental health problems and improves workers' mental health (2). Work intensity and wage income play an intermediary role in the relationship between the industrial AI transformation and workers' mental health (3). Potential endogeneity problems in the relationship between industrial AI and workers' mental health are considered, and robustness tests are conducted (including changing the dependent variables, independent variables and regression models). The main results and impact mechanisms remain robust and reliable. This study extends the research on the relationship between industrial AI and workers' health, which has important theoretical implications. Additionally, based on the Chinese context, this research has important implications for the current AI transformation in developing countries. Transition economies with labor shortages can achieve a win-win situation by promoting industrial AI to fill the labor gap and improve workers' mental health.

Keywords: mental health, work intensity, wage income, transformation to industrial artificial intelligence, workers

INTRODUCTION

Artificial intelligence (AI) is an important force driving economic and social development, and it is a strategic field in which various countries compete. As the largest developing country in the world, China is currently undergoing an unprecedented process of transformation to AI, especially in the industrial field. The application of AI technologies such as industrial robots is becoming increasingly extensive, and human society is accelerating toward a new stage of high automation. The impact of the transformation to industrial AI on society is far-reaching (1), and it has become a focus of current academic research. Findings on the social impact of this transformation are mixed. On the one hand, the application of AI technology not only brings new products and services but also improves production efficiency and product quality, which play a significant role in promoting social welfare and meeting people's material and spiritual needs (2, 3). During the transformation to industrial AI, robots take the place of people to engage in dangerous work, preventing workers' exposure to hazardous working environments, which can protect occupational safety and reduce occupational injuries (4). However, on the other hand, the substitution effect of

AI robots for human labor has aroused public concern about this transformation (5). For example, the application of emerging technologies such as AI increases social learning pressure and anxiety about the use of new technology (6). In addition, some studies have found that the mismatch between the application requests for industrial robots and workers' skills has not only failed to reduce occupational injuries but also led to more frequent and serious occupational injuries in emerging economies (7, 8).

However, existing studies ignore the changes in workers' mental health in the context of the transformation to industrial AI. The application of new technology has an important impact on workers' mental health (9). For example, Borle et al. (10) found that high-intensity digital work inhibited workers' mental health. We aim to clarify the impact of this transformation on workers' mental health. In the past decade, the transformation to industrial AI has led to profound changes in the labor market, directly affecting employment opportunities, methods and income (11). Undoubtedly, these changes have affected workers' mental health. For example, based on cross-border data, Cords and Prettner (12) found that this transformation led to increased unemployment and decreased wages for low-skilled workers. Jung and Lim (13) found that the application of industrial robots suppressed employment and reduced average wages. Unemployment and low income levels are important sources of workers' stress and poor mental health (14, 15). Moreover, the application of industrial robots causes technophobia and leads to negative emotions among workers, who may easily become groups with mental health problems such as anxiety and depression (16). From this viewpoint, the transformation to industrial AI may increase workers' mental health problems. However, these studies ignore an important issue; that is, this transformation may be in line with the times. For example, in a country with a serious shortage of industrial labor, the transformation to industrial AI can alleviate the labor gap faced by enterprises and reduce labor intensity (17). Furthermore, this transformation means an improvement in labor productivity, which increases workers' income level (18). As mentioned above, increased income is a favorable factor for workers' mental health.

The analysis above shows that the impact of the transformation to industrial AI on workers' mental health is uncertain (19). We explore the impact of this transformation on workers' mental health in China. The reason why we take China as the research object is that it allows us to clarify the impact of this transformation on workers' mental health when the transformation conforms to the times. We believe that the transformation to industrial AI is in line with the times in China for the following main reasons. On the one hand, China is currently facing a labor shortage, which is an important factor in promoting this transformation. China is the world's manufacturing factory, and the huge scale of its manufacturing industry involves an enormous demand for labor (20). However, factors such as the aging population and the low skill level of workers contribute to China's labor shortage (21). On the other hand, China has the economic basis and technical conditions for the transformation to industrial AI (22). In recent years, the speed of this transformation in China

has surpassed that in almost any other country in the world, and the quantity of industrial robots imported ranks first in the world (3). Meanwhile, industrial AI technology is developing rapidly in China (23). Therefore, the transformation to industrial AI conforms to the Chinese reality. Furthermore, China is a transition country subject to widespread global attention. Exploring the impact of the transformation to industrial AI on workers' mental health in China is of referential significance for other transition economies to promote high-quality industrial AI (24).

Based on the above analysis, we measure the penetration rate of urban robots based on data disclosed by the International Robotics Alliance, which is regarded as a measure of the level the transformation to industrial AI in cities. We match China Family Panel Studies (CFPS) data with data on this transformation at the city level to conduct the empirical analysis. The regression results show that China's transformation to industrial AI effectively alleviates a variety of workers' mental health problems, and robustness tests based on various methods support this conclusion. Thus, we find that in a large transition economy such as China's, if the transformation to industrial AI is in line with the times, then it may help alleviate workers' mental health problems instead of causing fear of technology. Moreover, through a mediating effect model, we find that industrial AI may improve workers' mental health by increasing their wage income and reducing working hours. This research answers the questions of not only whether but also how the transformation to industrial AI affects workers' mental health, which has crucial theoretical and practical significance.

METHODS

Data

The data used in this paper are mainly from the International Federation of Robotics (IFR) and the nationwide CFPS conducted by the China Social Science Research Center of Peking University. The data contain information on the installation of industrial robots in 50 countries from 1993 to 2018, and the industries involved are from the following six categories: agriculture, forestry, animal husbandry and fishery; mining; manufacturing; electricity, heat, gas and water production and supply; construction; and education. We use the industrial enterprise module from the Second National Economic Census data to calculate the number of people employed in different industries in each prefecture-level city (region, autonomous prefecture, and league). We measure the density of industrial robot installation in each city combined with the IFR data to measure the level of the transformation to industrial AI in the city.

CFPS is a national, comprehensive, and highly authoritative large-scale social tracking survey project that collects data from individuals, families, and communities through face-to-face or telephone interviews and off-site follow-up interviews. It leads to changes China's social, economic, demographic, educational, and health conditions and provides a public policy formulation and academic research database. The project is conducted once every 2 years, and five rounds of surveys have been

conducted: in 2010, 2012, 2014, 2016, and 2018. A community questionnaire database, a household questionnaire database, an adult questionnaire database, and a pediatric questionnaire database have been established. This paper focuses on the impact of robot use on workers' mental health, uses 2014 survey data, and retains only employed individuals. We chose the survey data from the 2014 wave because there are differences in the way mental health is measured in the CFPS questionnaires for each year. In addition, China started to use robots on a large scale after 2013. After further eliminating observations with missing variables, the final valid sample size is 7,731.

Variable Definition

Explained Variables

This paper focuses on the impact of the AI industrial transformation on workers' mental health, and the dependent variable is workers' mental health. The "Partial Behavior and Mental State Measurement" module of the CFPS Individual Questionnaire asked respondents about six aspects of their mental state in the past month: "How often do you feel emotionally frustrated, depressed, and unable to do anything uplifting?", "How often are you nervous?", "How often do you feel restless and have trouble staying calm?", "How often do you feel hopeless about the future?", "How often do you find it difficult to do anything?", and "How often do you think life is meaningless?" There were 5 answer options: 1. Almost every day; 2. Often; 3. Half of the time; 4. Sometimes; 5. Never. The survey reflects workers' psychological state; the larger the value is, the better the psychological state.

Core Explanatory Variables

This paper's core explanatory variable is the transformation to industrial AI, measured by the density of industrial robot installations at the city level. We mainly use the IFR dataset and the Second National Economic Census industrial enterprise data to calculate the industrial robot installation density. Since the IFR data contain only industrial robot installations at the industry level and city-level industrial robot installations are not available, we draw on Acemoglu and Restrepo (5) to calculate the robot installation density with the Bartik instrumental variable to represent the intensity of the impact of robot technology. First, we match the IFR data with China's Second Economic Census data to obtain data at the industry level. Then, we select a base year to calculate the weights of robot density by industry for each city in China. We calculate the city-level industrial robot installation density accordingly. The specific calculation is as follows.

$$density_{ct} = \sum_j \frac{robot_{jt}}{emp_{j,t=2008}} * \frac{emp_{c,j,t=2008}}{emp_{c,t=2008}} \qquad (1)$$

where $\frac{robot_{jt}}{emp_{j,t=2008}}$ is the ratio of the stock of robots used in industry j per 10,000 employees, and $\frac{emp_{c,j,t=2008}}{emp_{c,t=2008}}$ is the ratio of employees in industry j to all employees in city c in 2008.

Control Variables

Referring to the existing literature, this paper controls for a series of variables that may affect employees' mental health,

including employees' age and age squared; employees' gender, with 1 for male and 0 for female; whether employees have spouses, with 1 for married or cohabiting and 0 for unmarried, divorced or widowed; employees' household status, with 1 for non-agricultural and 0 for agricultural; employees' education level, measured by the number of years of education; household size, defined by the number of people sharing daily activities; household elderly dependency ratio, measured by the proportion of people over the age of 60 years within the number of household members; household child dependency ratio, measured by the proportion of children under the age of 16 years within the number of household members; whether the household is entrepreneurial, with a value of 1 if a household member had been self-employed or started a private business in the past year; household financial status, measured by household income per capita; and household debt status, measured by total household debt. Both household average income and total indebtedness are treated logarithmically. The paper also includes city-level control variables, including urban GDP, urban wage, industrial structure, and unemployment rate. **Table 1** shows the descriptive statistics for each variable.

Model Settings

Given that the purpose of this study is to examine the impact of the transformation to industrial AI on workers' mental health, the following benchmark regression model is set.

$$Mentalhealth_{ic} = \alpha + \gamma robot_c + X_{ic}\beta + \varepsilon_i \qquad (2)$$

In the above equation, i represents an individual worker and c represents the city where the individual is located. The dependent variable $Mentalhealth_{ic}$ denotes the individual's mental health status; the core explanatory variable $robot_c$ denotes the level of the transformation to industrial AI in the employee's city. The coefficient γ reflects the marginal impact of the transformation to industrial AI on the individual's mental health, and X_{ic} is a series control variables related to individuals, families, and cities that may affect the mental health of workers. This paper uses clustered robust standard errors at the individual level.

EMPIRICAL RESULTS

Baseline Estimates

Table 2 presents the ordinary least squares (OLS) regression estimation results of the impact of the transformation to industrial AI on workers' mental health. Columns (1)–(6) contain the six individual aspects reflecting workers' psychological health. After adding individual-, family- and city-level control variables, we find that the estimated coefficient of this transformation is always positive and significant at the 1% level, indicating that this transformation in cities significantly improves workers' mental health. Thus, in contrast to studies such as Borle et al. (10), we do not find evidence of negative effects of emerging technology adoption on workers' mental health. In contrast, we find that in a large manufacturing country such as China, the transformation to industrial AI significantly improves workers' mental health and effectively alleviates multiple psychological problems. This

TABLE 1 | Descriptive statistics.

Variables	Observations	Average value	Standard deviation	Minimum value	Maximum value
Cannot cheer up	7,731	4.267	0.858	1	5
Mental tension	7,731	4.414	0.836	1	5
Restless	7,731	4.558	0.746	1	5
No hope	7,731	4.730	0.644	1	5
Feel that life is difficult	7,731	4.550	0.736	1	5
Meaninglessness	7,731	4.763	0.594	1	5
Robot	7,731	7.686	3.163	2.378	18.540
Age	7,731	39.220	12.51	16	83
Male	7,731	0.585	0.493	0	1
With spouse	7,731	0.806	0.395	0	1
Non-agricultural household	7,731	0.446	0.497	0	1
Years of education	7,731	10.030	3.924	0	22
Family size	7,731	4.184	1.786	1	17
Household elderly dependency ratio	7,731	0.111	0.196	0	1
Household child dependency ratio	7,731	0.138	0.156	0	0.714
Home-based business	7,731	0.064	0.246	0	1
Household income per capita	7,731	9.580	0.826	5.122	11.320
Total household liabilities	7,731	3.517	5.137	0	12.950
GDP per capita	7,731	58.100	31.55	10.170	146.5
Wage per capita	7,731	10.860	0.282	10.390	11.430
Industry structure level	7,731	0.945	0.367	0.262	2.950
Unemployment rate	7,731	0.008	0.006	0.001	0.029

suggests that this transformation in China is timely in its impact on workers' mental health, which may be because it improves workers' income level and reduces labor intensity. We will test this mechanism in a follow-up study.

Instrumental Variable Estimation

Table 2 benchmark estimation results show that robot use significantly improves employee mental health. However, the results may be biased, and the setting of the baseline regression equation may involve endogeneity problems due to omitted variables and bidirectional causality. On the one hand, there may be unobserved factors that affect workers' mental health that also affect robot use, leading to the omitted variable problem; on the other hand, workers' mental health may reverse the demand for robot use, so a reverse causality problem may exist. This paper draws on Acemoglu and Restrepo (5) to mitigate the potential endogeneity problem by using industrial robot density in the US to construct the instrumental variable for the corresponding sample city as follows:

$$robot\_IV_{ct} = \sum_j \frac{robot\_US_{jt}}{emp_{j,t=2008}} * \frac{emp_{c,j,t=2008}}{emp_{c,t=2008}}$$

where $robot\_US_{jt}$ denotes the robot use stock of industry j in the US in year t, $emp_{c,t=2008}$ is the employment of industry j in China in 2008, $emp_{j,t=2008}$ is the employment of industry j in city c in China in 2008, and emp_$emp_{c,j,t=2008}$ is the employment of industry j in city c in China in 2008.

Using robot density as an instrumental variable for other countries globally with industrial robot development similar to that in China is a common approach in the relevant literature. The choice of using US industrial robot data is based on the following considerations. First, before 2013, China's robot use had long relied on imports, and the US was one of its main import countries. Second, during the sample period, the development trend of industrial robot applications in the US was relatively close to that in China, and robot technology in the US led the world. Industrial robot applications in the US can reflect the AI trend and satisfy the correlation assumption. Third, there is no evidence that the application of industrial robots in the US directly affects the mental health of employees in China (who are affected only by the application of industrial robots in China), satisfying the exogeneity assumption.

In this paper, the two-stage least squares (2SLS) method is used for the instrumental variable estimation, and the regression results are presented in **Table 3**. Columns (1)–(6) present the regression results using the density of industrial robot stock in the US as an instrumental variable, and column (7) contains the first-stage estimation results. The regression coefficients of the instrumental variables are positive and significant, indicating that industrial robot application promotes the mental health of workers.

Robustness Test
Substitution of Core Explanatory Variables

Before 2013, more than 70% of China's industrial robots were imported from Japan, Europe, and North America (3). According

TABLE 2 | Impact of AI transformation on workers' mental health: baseline estimates.

| | (1) | (2) | (3) | (4) | (5) | (6) |
	Depress	**Nervous**	**Calm**	**Hope**	**Difficulty**	**Meaningful**
Robot	0.0201***	0.0106***	0.0101***	0.0083***	0.0076**	0.0084***
	(0.0035)	(0.0035)	(0.0030)	(0.0026)	(0.0030)	(0.0024)
Age	−0.0072	−0.0122**	−0.0059	−0.0067	−0.0094**	−0.0129***
	(0.0055)	(0.0051)	(0.0047)	(0.0042)	(0.0048)	(0.0038)
Age^2	0.0140**	0.0193***	0.0085	0.0083*	0.0137**	0.0143***
	(0.0065)	(0.0059)	(0.0055)	(0.0050)	(0.0056)	(0.0045)
Male	0.1223***	0.1065***	0.1020***	0.0826***	0.0680***	0.1070***
	(0.0203)	(0.0199)	(0.0179)	(0.0157)	(0.0176)	(0.0145)
Spouse	0.0507	0.0247	0.0295	0.0737***	0.0760***	0.0706***
	(0.0321)	(0.0297)	(0.0266)	(0.0252)	(0.0286)	(0.0222)
Non-agricultural	−0.0490**	−0.0520**	−0.0467**	−0.0503***	−0.0408**	−0.0165
	(0.0228)	(0.0221)	(0.0201)	(0.0177)	(0.0197)	(0.0162)
Educ_year	0.0017	−0.0019	0.0103***	0.0077***	0.0086***	0.0103***
	(0.0030)	(0.0029)	(0.0026)	(0.0024)	(0.0027)	(0.0022)
Family size	0.0113*	−0.0007	0.0062	0.0138***	0.0097*	0.0132***
	(0.0060)	(0.0062)	(0.0055)	(0.0043)	(0.0051)	(0.0043)
Elderly_ratio	−0.0656	−0.0621	−0.0157	−0.0781*	−0.0596	−0.0757*
	(0.0563)	(0.0548)	(0.0522)	(0.0465)	(0.0515)	(0.0434)
Child_ratio	−0.0861	0.0291	−0.0127	−0.0034	0.0609	0.0277
	(0.0711)	(0.0687)	(0.0617)	(0.0529)	(0.0602)	(0.0484)
Selfemploy_family	−0.0130	−0.0059	−0.0175	0.0372	−0.0602*	−0.0070
	(0.0389)	(0.0383)	(0.0337)	(0.0256)	(0.0310)	(0.0269)
L_wincome_per	0.0598***	0.0426***	0.0568***	0.0537***	0.0819***	0.0609***
	(0.0142)	(0.0140)	(0.0123)	(0.0105)	(0.0127)	(0.0106)
L_wtotal_debts	−0.0056***	−0.0080***	−0.0083***	−0.0058***	−0.0098***	−0.0048***
	(0.0019)	(0.0019)	(0.0017)	(0.0015)	(0.0017)	(0.0014)
Pgdp	−0.0001	−0.0004	0.0007	0.0001	0.0009*	0.0004
	(0.0006)	(0.0005)	(0.0005)	(0.0004)	(0.0005)	(0.0004)
Lnpwage	0.0233	0.2255***	−0.0336	0.0184	0.0157	0.0308
	(0.0716)	(0.0705)	(0.0617)	(0.0563)	(0.0616)	(0.0491)
Industry structure	0.0074	−0.0307	0.0324	−0.0101	−0.0246	0.0061
	(0.0317)	(0.0295)	(0.0264)	(0.0247)	(0.0286)	(0.0211)
Unemp	−9.1411***	−9.3019***	−6.2199**	−6.4433***	−6.6718***	−6.2626***
	(2.9239)	(2.9241)	(2.5421)	(2.2200)	(2.4937)	(2.0623)
_cons	3.2887***	1.7515**	4.2079***	3.9363***	3.5206***	3.8152***
	(0.7471)	(0.7306)	(0.6359)	(0.5806)	(0.6401)	(0.5107)
N	7,731	7,731	7,731	7,731	7,731	7,731
R^2	0.0219	0.0204	0.0181	0.0188	0.0242	0.0287

*Robust standard errors are reported in parentheses. ***, **, and * denote significance at the 1%, 5%, 10% levels, respectively.*

to an IFR report in 2014, the number of new robots sold in China was 23,000 in 2012, of which Chinese suppliers produced only approximately 3,000, and this percentage was even lower before August 2012. Therefore, we use robot import data calculated from the China Customs Trade Database to measure industrial robot applications for robustness tests. Specifically, we match the imported industrial robot data from that database to importing firms and their locations to obtain the number of imported industrial robots and the total price of imports in the city. We

take the logarithmic value of the above two indicators and include them in Equation (1) for estimation.

Tables 4A,B show the estimation results of replacing the core explanatory variables with the number of industrial robots imported and the total price of imports. The table shows that the coefficients of the effects of the number of imported industrial robots installed and the import price on the mental health of workers are positive and significant at the 1% level. This indicates that the transformation to industrial AI has improved the mental

TABLE 3 | Instrumental variable estimation.

	(1) Depress	(2) Nervous	(3) Calm	(4) Hope	(5) Difficulty	(6) Meaningful	7 Robot
Robot	0.0189***	0.0100*	0.0091*	0.0166***	0.0069	0.0130***	
	(0.0061)	(0.0060)	(0.0053)	(0.0045)	(0.0053)	(0.0043)	
Robot-IV							13.6619***
							(0.2405)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Weak identification test							3,227
N	6,644	6,644	6,644	6,644	6,644	6,644	6,644
R^2	0.0211	0.0204	0.0185	0.0200	0.0257	0.0286	0.5059

*Clustered robust standard errors are reported in parentheses below the coefficients. ***, **, and * denote significance at the 1%, 5%, 10% levels, respectively. Control variables are estimated as in the* **Table 2** *benchmark.*

TABLE 4 | Robustness test: replacing core explanatory variables.

	(1) Depress	(2) Nervous	(3) Calm	(4) Hope	(5) Difficulty	(6) Meaningful
(A) Core explanatory variable is the number of robot imports						
Robot_number	0.0110***	0.0075**	0.0107***	0.0098***	0.0074***	0.0072***
	(0.0032)	(0.0033)	(0.0029)	(0.0026)	(0.0028)	(0.0024)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes
N	8,092	8,092	8,092	8,092	8,092	8,092
R^2	0.032	0.031	0.027	0.027	0.037	0.035
(B) Core explanatory variable is robot import price						
Robot_price	0.0033**	0.0029*	0.0043***	0.0039***	0.0033**	0.0031***
	(0.0015)	(0.0015)	(0.0013)	(0.0012)	(0.0013)	(0.0011)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes
N	8,092	8,092	8,092	8,092	8,092	8,092
R^2	0.032	0.034	0.028	0.028	0.040	0.036

*Clustered robust standard errors are reported in parentheses below the coefficients. ***, **, and * denote significance at the 1%, 5%, 10% levels, respectively. Control variables are estimated as in the* **Table 2** *benchmark.*

TABLE 5 | Robustness tests: replacing the dependent variable and replacing the regression model.

	(1) depress_dum	(2) nervous_dum	(3) calm_dum	(4) hope_dum	(5) difficulty_dum	(6) meaningful_dum
(A) Binary probit model						
Robot	0.0257***	0.0160***	0.0150**	0.0156**	0.0102*	0.0223***
	(0.0081)	(0.0057)	(0.0060)	(0.0068)	(0.0059)	(0.0071)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes
N	7,731	7,731	7,731	7,731	7,731	7,731
(B) Ordered probit model						
Robot	0.0286***	0.0160***	0.0162***	0.0174***	0.0123**	0.0232***
	(0.0050)	(0.0052)	(0.0055)	(0.0064)	(0.0054)	(0.0068)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes
N	7,731	7,731	7,731	7,731	7,731	7,731

*Robust standard errors are reported in parentheses below the coefficients. ***, **, and * denote significance at the 1%, 5%, 10% levels, respectively. Control variables are estimated as in the* **Table 2** *benchmark.*

TABLE 6 | Robustness test: changing the level of clustered standard errors.

	(1) Depress	(2) Nervous	(3) Calm	(4) Hope	(5) Difficulty	(6) Meaningful
Robot	0.0242***	0.0145**	0.0163***	0.0084**	0.0140**	0.0096***
	(0.0061)	(0.0058)	(0.0054)	(0.0041)	(0.0055)	(0.0036)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes
Provincial fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
N	7,731	7,731	7,731	7,731	7,731	7,731

*Robust standard errors are reported in parentheses below the coefficients. ***, **, and * denote significance at the 1%, 5%, 10% levels, respectively. Control variables are estimated as in the* **Table 2** *benchmark.*

TABLE 7 | Mechanism test.

	(1) Wage income	(2) Working hours
Robot	0.0309***	−0.2708**
	(0.0039)	(0.1119)
Age	0.0912***	0.6433***
	(0.0065)	(0.1754)
Age^2	−0.1135***	−1.0643***
	(0.0074)	(0.2101)
Male	0.4267***	5.9851***
	(0.0219)	(0.5800)
Spouse	0.0872***	−3.1904***
	(0.0332)	(0.8334)
Non-agricultural	0.0377	−5.0320***
	(0.0245)	(0.6834)
Educ_year	0.0429***	−0.7842***
	(0.0032)	(0.0890)
Pgdp	0.0005	0.0251
	(0.0006)	(0.0162)
Lnpwage	0.6319***	−8.1292***
	(0.0764)	(2.0642)
Industry structure	−0.0498	1.3566
	(0.0313)	(0.9344)
Unemp	−7.0962**	67.6066
	(2.9744)	(82.1810)
_cons	0.4667	131.8503***
	(0.7921)	(21.4466)
N	6443	7731
R^2	0.1843	0.0646

*Clustered robust standard errors are reported in parentheses below the coefficients. ***, **, and * denote significance at the 1%, 5%, 10% levels, respectively.*

health of workers and that the benchmark results described above are robust.

Substitution of Dependent Variable

Above, the dependent variable employee mental health is a subjective indicator reported by respondents. To exclude the interference of measurement error, we convert the dependent variable into a 0-1 variable. The specific approach is as follows: First, the mean values of the indicators of the six dimensions of

mental health are calculated separately. Second, six 0-1 variables are defined, and if the mental health value is above the mean level, the value is set as 1. At this point, the dependent variable is a 0-1 variable, and we use the binary probit model to re-estimate the impact of the transformation to industrial AI on workers' mental health. **Table 5A** shows the estimation results. We find that the coefficient of industrial robot penetration is still significantly positive, which is consistent with the baseline estimation results.

Replace Regression Model

Since the explanatory variable in this paper, employee mental health, is an ordered category variable, it takes values in the range of 1–5. Direct estimation by OLS is likely to cause the fitted values to fall outside the valid interval and thus lead to bias in the estimated coefficients. In such cases, scholars usually use maximum likelihood estimation (MLE) to obtain consistent estimates of the coefficients of the ordered probit model. Therefore, this estimation method is used in this paper, and the results are presented in **Table 5B**. The estimated coefficient of industrial robot penetration is still significantly positive, indicating that the transformation of industrial AI promotes the mental health of workers.

Changing Clustered Standard Error

Above, we control for clustered robust standard errors at the individual level due to heteroskedasticity. Considering that there may be commonality and correlation among different workers within the same city, we cluster the standard errors to the city level and include province fixed effects. **Table 6** shows the estimation results. The coefficient of industrial robot penetration remains significantly positive, again indicating the robustness of the finding that the transformation to industrial AI promotes workers' mental health.

After the robustness tests on the above aspects, the key findings of this paper hold. It is thus clear that the transformation to industrial AI in China can effectively improve workers' mental health.

Mechanism Analysis

The above analysis shows that robot use significantly improves workers' mental health. Then, what are the underlying mechanisms of action? It has been shown that the use of robots increases labor productivity and has complementary effects on workers in non-routine tasks, which in turn increases workers' wages and earnings (3). Meanwhile, Aghion et al. (25)

found that due to business stealing effects, automated firms displace their competitors, expand their production scale and increase their productivity, which in turn have a positive impact on employee employment and wages. Lower income levels and higher work intensity are important sources of increased psychological stress and mental illness among workers (15). To test these mechanisms, the following econometric model is constructed drawing on the existing literature.

$$Intervariable_{ij} = \beta_0 + \beta_1 robot_{ij} + \beta_2 X_{ij} + \varepsilon_i \qquad (3)$$

In the above equation, $Intervariable_{ij}$ represents the mediating variables in this paper, denoting employee wage income and working hours. X_{ij} denotes individual- and city-level control variables. Other variables are defined similarly to those in the benchmark model (2).

The regression results are shown in **Table 7**, where column (1) presents the estimation results for the effect of the transformation to industrial AI on the wage income of employees. This transformation significantly increases workers' wage income. Column (2) presents the estimation results of this transformation on the working hours of workers. The transformation significantly reduces employees' working hours. The results of these two mechanism tests indicate that the use of robots significantly improves mental health, mainly by increasing wage income and decreasing working hours.

DISCUSSION

With the new phase of the industrial revolution, an increasing number of studies have focused on the impact of industrial robot applications on local labor markets, including the employment structure, wage levels, and employee health (24, 26). The transformation to industrial AI is also gradually changing the human mindset, but little literature has focused on the psychological changes of workers in the context of this transformation, especially changes in workers' mental health. We explored the impact of this transformation on workers' psychological health and its mechanisms of action in the Chinese context based on matched data from the Chinese Household Tracking Survey and the penetration rate of industrial robots in cities.

We found that the transformation to industrial AI significantly improves workers' mental health. Considering that endogeneity problems due to omitted variables may have confounded our findings, we further tested these findings by constructing instrumental variables using US industrial robot data, and the results indicated that the transformation to industrial AI improves workers' mental health. In addition, we conducted robustness tests based on a range of methods, and the results also affirmed that this transformation improves workers' psychological wellbeing. This finding has important theoretical implications. In the existing literature, there are two contrasting effects of industrial transformation on workers' psychological wellbeing: unemployment and low income due to this transformation suppress workers' psychological wellbeing, or high income and low labor intensity due to this transformation

promote workers' psychological wellbeing (17). Our findings support the latter conjecture.

In addition, job income and work intensity are important sources of changes in workers' mental health (14, 27). Therefore, we further examined the effects of the transformation to industrial AI on workers' psychological health. We found that this transformation improves workers' psychological health by increasing their wage income and reducing their work intensity. Our study fills the gap in the research on workers' mental health in the context of the transformation to industrial AI.

This paper provides a new perspective for understanding the changes in workers' mental health during the transformation to industrial AI. By linking the use of robots at the city level to workers' mental health at the individual level, this paper improves the understanding of the relationship between technological upgrading and micro-level individual behavior. At the same time, this paper fills an important research gap in the context of AI, thus providing valuable policy implications for international comparisons. Additionally, empirical evidence from China provides reference value for other transition economies to promote high-quality industrial AI. The findings of this paper corroborate those of Cheng et al. (28), who find that China's overall view of robots has been positive, with little mention of the threat of job replacement in government documents promoting robot adoption and production. Rather than worrying about job replacement, the government emphasizes the adoption of robots as a way to address labor challenges. The conclusions of this paper suggest that the transformation to industrial AI has instead improved the mental health of workers. Thus, AI is in line with the times, and we need not be overly concerned about the disruptive effects of AI on the workforce. The findings of this paper have important practical implications for driving AI change in developing countries.

CONCLUSION

This paper matches CFPS data with urban robot data provided by IFR and uses OLS regression, probit regression, ordered probit regression, and instrumental variables to study the impact of the transformation to industrial AI on workers' mental health. We found that robot use significantly influences workers' mental health, improving all six aspects of workers' mental health. The findings remained robust after a series of robustness tests, such as replacing explanatory and explained variables and replacing regression models. In addition, to avoid endogeneity problems due to omitted variables and two-way causality, the density of industrial robots in the US was used to construct the density of industrial robots at the corresponding sample city level as an instrumental variable. The conclusions showed that the benchmark results are robust and reliable. The mechanism analysis shows that robots significantly increase workers' wage income and decrease workers' working hours, verifying the mechanism effect of robots on workers' mental health levels.

With the rapid development of robotics, there is considerable literature focusing on the impact of technological progress

on the labor market. However, attention to micro-level of individuals remains insufficient, and even less literature has explored workers' mental health in the context of technological change. Accordingly, this paper examines changes in workers' mental health in the context of the transformation to industrial AI in China. The paper further explores the mechanisms of the effects of robot use on workers' psychological health from the perspectives of both wage income and work intensity. This study extends the research on the relationship between industrial AI and workers' health, which has important theoretical implications. Additionally, based on the Chinese context, this paper has important implications for the current AI changes in developing countries. Transition economies with relative labor shortages can achieve a win-win situation by promoting industrial AI to fill the labor gap and improve workers' psychological health.

Of course, there are some limitations in this paper. First, the data used are cross-sectional and do not reveal long-term persistent effects of the transformation to industrial AI on workers' mental health levels. Similarly, limited by data availability, this paper measures the transformation to industrial AI at the city level, which does not accurately reflect workers' exposure to and use of industrial robots. Second, although we explored the mechanisms underlying the effects of the transformation to industrial AI on workers' mental health, we

did not explore its boundary conditions in depth. Future research can further explore the mechanisms and boundary conditions of the effects of this transformation on workers' mental health at the micro-level of individuals.

DATA AVAILABILITY STATEMENT

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author/s.

AUTHOR CONTRIBUTIONS

SY drafted and critically revised the paper for intellectual content. KL and JG made substantial contributions to the concept and design of the work, data interpretation, and the drafting of the article. XH drafted and critically revised the paper and polished the language of the revised draft. All authors contributed to the article and approved the submitted version.

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Impact of the Gap Between Social Workers' Work Interaction Frequency With Governments and Clients on Their Burnout in China: Mediating Effects of Role Conflict and Moderating Effects of Non-front-line Work

Jie Wang[1], Zimin Tan[2]*, Jiajun Li[3] and Qiang Wu[4]

[1] Center for Chinese Public Administration Research, Guangzhou Research Centre for Social Security, School of Government, Sun Yat-sen University, Guangzhou, China, [2] Social and Public Administration School, East China University of Science and Technology, Shanghai, China, [3] Department of Sociology, Sun Yat-sen University, Guangzhou, China, [4] School of Public Administration and Policy, Renmin University of China, Beijing, China

Background: Since the 2000s, local governments have contracted out more and more social services to social work organizations in China. Social workers are thus experiencing the inconsistency between local governments' and clients' demands and the deviation from the professional duty of helping clients, which may result in conflicting and unclear roles in their jobs and further lead to burnout. Based on the Role Stress-burnout Model and the previous theoretical and field-work investigations, this study examined the effects of the government-client work interaction frequency gap on social workers' burnout as well as the mediating effects of role ambiguity and conflict and the moderating effects of the non-front-line work.

Methods: A cross-sectional study of 2,643 front-line social workers and 2,599 supervisors or managers from 56 major cities all over China was conducted. Work burnout was measured by the 22-item three-dimension Maslach's Burnout Inventory Scale. Rizzo et al.'s 14-item scale measured role conflict and ambiguity. The government-client working interaction frequency gap was measured by the difference between the five-point level of work interaction frequency with governments minus the one with clients. Structural equation modeling was adopted to test the mediation and moderation models.

Results: Results showed that for the front-line social workers, besides directly reducing personal accomplishment, the government-client work interaction frequency gap could indirectly neutralize its alleviating effects on emotional exhaustion (Mediating effect ratio = −63.64 %), make its total effects on depersonalization significant (37.03%), and reduce personal accomplishment further (23.08%) through increasing social workers' feeling of role conflict. However, the above mediating effects of role conflict were not

significant for social workers with extra management or supervision workload, revealing the moderating effects of non-front-line work.

Conclusions: This study revealed that front-line social workers in China who had more work interaction with governments and less with clients could have higher role conflict, increasing their burnout further. Therefore, social work educational programs should include adequate mental adjustment courses and practical emplacement to prepare students for the potential role conflict. Furthermore, higher-level governments should issue relevant regulations to form a collaborative rather than an employment relationship between local governments and social worker organizations.

INTRODUCTION

Since the 2000s, China has witnessed a rapid growth in the number of non-governmental organizations (NGOs), including social work organizations. In 2020, over 669 thousand qualified social workers in China played a vital role in social service and local governance (1). However, social workers have a high risk of burnout, which is considered a worldwide issue (2–5) and concerns the social work industry in China (6, 7). Existing literature associated social workers' burnout with their mental and physical health problems, such as depression (8, 9), sick-leave absences (10), and self-reported health problems (11). The burnout also increased social workers' intentional (12) and actual turnover (13).

Furthermore, when they localize Western social work theories and practices, Chinese social workers find they work in a considerably different environment from their western counterparts as they are highly involved in the local governance (14, 15). To be more specific, compared with the mature social work industry in the west, the professionalism of social work in China is still under development after being abandoned by the revolutionary regime in the 1950s and re-introduced in the late 1980s (16). In addition, Chinese social work tends to be embedded into the existing executive-led and unprofessional social service system (16, 17). The westernized social work ideologies of "individualism, democracy, and Christianity" do not sit comfortably in China's unique social and political backgrounds (18). Therefore, it is crucial to further explore social worker burnout in China's social and political context.

Burnout is characterized as a crisis in one's relationship with work (19). In the condition of burnout, workers become worn out or exhausted as their energy, strength, and resources encounter excessive demands (4). Maslach and Jackson generated a three-dimension definition of burnout, the Maslach Burnout Inventory (MBI), including emotional exhaustion, depersonalization of clients, and reduced personal accomplishment (RPA) (20). These three dimensions were considered to be psychologically discrete (21).

Due to the Chinese government's strong promotion, social work organizations have been playing an important role in social governance in both urban and rural areas (17, 22, 23), but the strong government involvement could be a macro factor causing

role stress on social workers (7), which could, in turn, increase their burnout. Role stress is a response that occurs when workers face job requirements that do not match their knowledge and skills, thus challenging their coping ability (24). Role stressor includes two dimensions, i.e., role conflict and role ambiguity (25, 26). Role conflict refers to the feeling of conflicting requirements or competing values at work or requiring the realization of multiple roles in a task (27, 28). Role ambiguity refers to the uncertainty in the definition, expectation, responsibility, and task of one's role, and workers thus do not know what kind of behavior they are expected to do when encountering a specific situation (29). Amplified existing research confirmed the role stress-burnout model that role stress and its two dimensions had a positive direct effect on burnout (30–35), and so had they among social workers (36, 37) and social workers in China (7, 38).

Since the governments contract out massive social services to social work organizations in China, social work organizations' legitimacy and financial resources largely depend on local governments (39, 40). Social workers are thus often in a weaker position when they work with local governments. Therefore, under the contracting-out social services arrangement, they usually have to conduct the additional workload imposed by local governments besides helping their clients with professional skills (41). That administrative workload includes two types: one could be potentially relevant to their professional work, such as assisting government departments with interviewing and investigating, organizing contemporary events, and conducting telephone follow-ups for social service recipients, while the other one is just daily chores utterly irrelevant to their professionalism, such as assisting government departments with sending, receiving or copying documents, drafting unimportant reports, and carrying out reception work (42). If social workers have to deal with local governments too often, they may not have enough time to provide professional services for their clients, and thus the deviation in the time-allocating priority may stress social workers. For example, this additional workload from dealing with governments could cause role ambiguity among social workers as it deviated from their professionalism of focusing on helping clients, especially the underprivileged ones (43, 44). On the other hand, some local governments' demands in China, such as unjustly allocating social welfare resources, emphasizing social control rather than professional caring, and

FIGURE 1 | Hypothesized model.
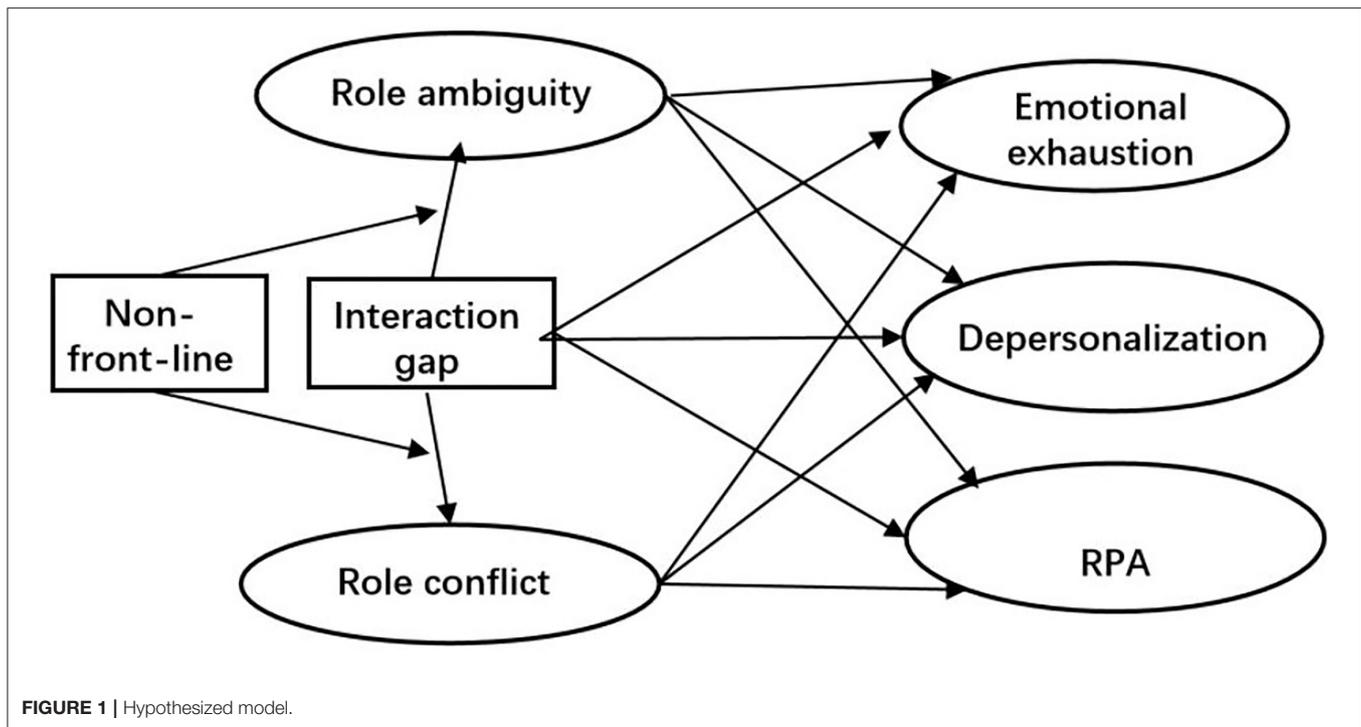
ignoring the underprivileged clients' willingness, conflicted with social work professionalism, and this *anti-social-work* thus could cause role conflict among social workers (45, 46). However, the above viewpoints and findings on the effects of the tension between working with governments and clients on social workers' role stress in China were based on theoretical discussion or qualitative exploration, which few studies have investigated with quantitative methods.

Furthermore, the tension between working with governments and clients reflects the long-standing debate on the contradictory understandings of social work ethics between the conventional western social work view focusing on *helping people to help themselves* and Chinese social work's local knowledge of participating in social governance and conducting administrative affairs (18, 47). The ethics tension could cause burnout among workers (48, 49), and so did the two role stressors through the role stress-burnout model reviewed in the above paragraphs. Therefore, it is necessary to investigate whether the tension between working with governments and clients could impact social workers' burnout through the mediating effects of role ambiguity and conflict, which has not been researched in China.

Existing research indicated that burnout was higher among front-line health care workers than the second-line ones (50, 51). In terms of the social work vocation, the front-line social workers in China could feel the obvious tension between working with governments and clients since they found it was difficult to reconcile the role assigned by local governments with their professional role (45, 52, 53). However, the primary role responsibility of the management of a social work organization was to respond to the funding bodies, usually the local governments in China (54, 55). Therefore, the front-line social

workers may experience different role stress caused by the tension between working with governments and clients from the non-front-line ones in China, and such a difference may result in different burnout between those two groups, which little research has investigated.

Based on the Role Stress-burnout Model and the previous theoretical and field-work investigations on the tension caused by social workers working with local governments in China, this study examines the effects of the tension between working with governments and clients indicated by the deviation in the social worker's time-allocating priority from their professionalism, which is measured the by the government-client work interaction frequency gap (Interaction gap), on social workers' burnout as well as the mediating effects of role stress (role ambiguity and conflict) and the moderating effects of the non-front-line work (manager and/or supervisor). Understanding how the tension affects social workers' burnout is meaningful, a research gap identified by our literature review. **Figure 1** depicts the hypothesized model. For simplicity of the model, this figure only displays the associated paths for the independent, mediating, moderating, and dependent variables, while the path diagram of control variables is omitted.

METHOD

Sample

This study used cross-sectional data from the first wave of the China Social Work Longitudinal Study (CSWLS) in 2019, the first national survey for the social work profession in China. The CSWLS aims to establish a large, comprehensive, and longitudinal dataset about workplace attitudes and behaviors

of social workers and the workplace conditions in social work organizations through three rounds of data collection. The first round of data collection for CSWLS was conducted by the East China University of Science and Technology (ECUST) from June to October 2019 [for more details, see Yuan et al.'s introduction (56)].

The CSWLS 2019 received 5,965 individual questionnaires filled in by professional social workers employed by 979 social work organizations located in 56 major cities of 30 province-level administrative regions (except Hong Kong, Taiwan, Macau, and Tibet) all over China. All sampled participants of our study were at least partly involved in front-line social work. After excluding incomplete questionnaires, the sample size is 5,242.

Ethical Approval

Participants of CSWLS were informed about the aims, objectives, and framework of the survey and assured that their responses would be kept strictly anonymous and confidential. Written informed consent was collected from each participant confidentially. The research ethics committee of ECUST granted the ethical approval for the CSWLS (57). Furthermore, the ethics committee of the first author's university approved the research protocol of this article.

Measures

Dependent Variables

Work burnout was measured by the Chinese version (58) of Maslach's Burnout Inventory-Human Service Survey (MBI-HSS) developed by Maslach et al. (21). The 22-item self-reported MBI-HSS consisted of emotional exhaustion (nine items), depersonalization (five items), and reduced personal accomplishment (RPA, eight items), which three subscales evaluated the emotional reactions caused by excessive work stress, the stress-induced attitudes and feelings toward the service recipient, and the feelings of competence and achievement in one's work separately. The MBI-HSS uses a seven-point Likert-type scale (0 = never and 6 = once every day). Cronbach's alpha for the above three subscales were 0.918, 0.816, and 0.921, respectively.

Independent Variable

This study focused on the tension between working with governments and clients indicated by the deviation in the social worker's time-allocating priority from their professionalism. Therefore, we constructed the government-client work interaction frequency gap (Interaction gap) as the independent variable, which was measured by the difference between the self-reported frequency level of work interaction with contract-issuing government departments minus the one with clients. That self-reported work interaction frequency level is a five-point ordinal variable based on the item "How often do you deal with the following types of people (e.g., clients and government departments) at work respectively?" and its responses range from 1 = never to 5 = always. Although the evaluation criteria of interaction frequency level are subjective, the criteria for the governments and the clients are the same for the same person. Therefore, measuring the gap can help reduce the impact of different evaluation criteria between respondents on the estimation.

Mediators

The role stress was measured by the Chinese version [as cited in Liao's article (59)] of the shortened form of the Role Conflict and Ambiguity Scales developed by Rizzo et al. (60). The 14-item self-reported scale consists of the nine-item role conflict (RC) and the five-item role ambiguity (RA) sub-scales. The respondents were invited to indicate the degree to which the condition described in the items applied to them on a five-point Likert-type scale ranging from 1 (strongly disagree) to 5 (strongly agree). Cronbach's alpha for the above two subscales were 0.855 and 0.827, respectively.

Moderator

We used the variable Non-front-line as the moderator, which was measured as follows: whether the respondent focused on the front-line social work (Non-front-line = 0, front-line social worker, $N = 2,643$) or undertook both front-line social work and supervision or management work (Non-front-line = 1, non-front-line social worker, $N = 2,599$).

Controls

This study's controls included three categories of variables: (a) demographic variables of a respondent, including age, gender, and educational attainment, (b) job-related characteristics of a respondent, including monthly income (natural logarithm), length of work experience at the current organization, length of work experience in the social work profession, hours of work per week, and (c) variables of the organization where a respondent worked, including organization age, size of the management board, number of full-time employees, numbers of full-time employees with at least the bachelor's degree, with the social work degree, and with the social work vocational qualification certificate respectively, level of the registered district (province, municipality or district/county), political connection, and the autonomy of expansion (registering a similar organization outside the registered district), service district (providing services outside the registered district), and service content (not undertaking other work arranged by the government outside the contract). We referred to the research of Ye and Sun (40) and Su et al. (57) to design the framework of control variables, and the measurement of those variables can be found in those two articles. We excluded the social support variables and the organization's annual revenue variable due to massive missing values in those variables. Descriptive characteristics of the variables for the front-line and the non-front-line social worker groups are reported separately in **Table 1**.

Data Analysis

This study adopted structural equation modeling (SEM) to analyze the data and test the model using Stata 16.0 (Stata Corporation, College Station, TX, USA). Since this study has a large sample size, it would not be easy to test the degree of modeling fitness by the χ^2 (61, 62). We thus used the following three indices that are widely applied to evaluate the model fit:

Variables	Front-line		Non-front-line	
	Mean/N	SD/%	Mean/N	SD/%
Demographic variables				
Age (17–70)	29.05	7.53	31.45	7.62
Gender				
Male	455	17.22	627	24.12
Female (reference)	2,188	82.78	1972	75.88
Educational attainment				
Junior secondary and below (1)	26	0.98	18	0.69
Senior secondary (2)	218	8.25	121	4.66
Associate's degree (3)	899	34.01	601	23.12
Bachelor's degree (4)	1,371	51.87	1584	60.95
Master's degree and above (5)	129	4.88	275	10.58
Monthly income (CNY)	3275.78	965.13	4349.71	1654.13
Job-related characteristics				
Years working in current org. (0–21)	1.61	2.15	3.10	3.05
Social work experience (Year, 0–35)	2.32	2.70	4.62	3.75
Work hours per day (0.2–18)	7.59	1.02	7.90	1.28
Organization-related variables				
Organization age (Year)	6.08	3.36	6.20	3.62
Size of the management board (0–27)	5.22	2.67	5.31	2.82
Full-time employees (0–800)	62.96	108.93	73.34	144.59
Full-time employees with — Bachelor's degree (0–632)	32.97	68.56	40.33	96.29
social work degree (0–216)	20.10	32.45	20.69	35.60
quali. certificate (0–543)	30.99	58.78	39.11	90.42
Political connection				
Yes	2,081	78.74	2064	79.42
No (reference)	562	21.26	535	20.58
Level of registered district				
Province (reference)	440	16.65	420	16.16
Municipality	780	29.51	803	30.90
County/district	1,423	53.84	1376	52.94
Autonomy of expansion				
Yes	722	27.32	773	29.74
No (reference)	1,921	72.68	1826	70.26
Autonomy of service district				
Yes	1,208	45.71	1189	45.75
No (reference)	1,435	54.29	1410	54.25
Autonomy of service content				
Yes	1,533	58.00	1554	59.79
No (reference)	1,110	42.00	1045	40.21

Full sample size = 5,242, Front-line sample size = 2,643, Non-front-line sample size = 2,599; 1 CNY ≈ 0.157 USD.

the root mean square error of approximation [RMSEA; (63)], comparative fit index [CFI; (64)], and Tucker–Lewis index [TLI; (65)]. The application of RMSEA, CFI, and TLI is contingent on a set of cutoff criteria: 1) an RMSEA value of <0.05 indicates a close fit, and that <0.08 suggests a reasonable model–data fit (66), 2) a CFI value of > 0.9 indicates that the model is good (64), and 3)TLI >0.90 indicates an acceptable fit (67).

RESULTS

Pearson's correlation was used to analyze the correlations between the government-client work interaction frequency gap, two role stress variables (i.e., role conflict and role ambiguity), and three burnout variables (i.e., emotional exhaustion, depersonalization, and reduced personal accomplishment) in this study. The means, standard deviations, and correlations for each variable are presented in **Table 2** for the sample of front-line social workers and in **Table 3** for the sample of non-front-line social workers.

Test of Measurement Model

The measurement model of five latent variables, including two role stress subscales and three burnout subscales, should be verified before the structural model validation. Results show that the measurement model has a good fit index for the full sample and both the samples of front-line social workers and non-front-line social workers. In terms of the full sample, although χ^2 (7,275.955, $df = 545$, $N = 5,242$, $p < 0.001$) is significant, the other three indicators show that the model fits well: RMSEA (0.049) is less than the cutoff value of 0.05 while CFI (0.926) and TLI (0.920) are greater than the cutoff value of 0.9. Therefore, RMSEA, CFI, and TLI results show that the measurement model fits well. In addition, the model analysis results show that the selected observation variables effectively reflect the intrinsic structure of the latent variable, as all the variables that make up the latent variable in this model have significant loadings on the latent variable. The standard factor loadings of all the variables that make up the latent variable are between 0.356 and 0.868 (shown in **Table 4**), and the acceptable factor loading is above 0.3 (68, 69). Therefore, the measurement model confirms the reliability and validity of the latent variables. We also checked the fit index of the measurement model for the front-line sample (RMSEA = 0.049, CFI = 0.925, and TLI = 0.918) and the non-front-line sample (RMSEA = 0.050, CFI=0.924, and TLI = 0.917) separately, and the measurement model fits well with the data of both samples. According to the model analyses for both samples, all the variables' standard factor loadings are above 0.3.

Test of Structural Model

We used SEM to test the fitness of the hypothesized model in **Figure 1**. We first tested the mediation part of the model. Due to the large sample size ($N = 5,242$) and the satisfying results of the other three fitness indicators (RMSEA = 0.037 < 0.05, CFI = 0.914 > 0.9, and TLI = 0.906 > 0.9), the structural model has an adequate fit with the full sample data. **Figure 2** displays the standardized results of the associated paths for the independent, dependent, and mediating variables. The diagram shows that the effects of government-client work interaction frequency gap on social workers' burnout are mediated by role conflict ($\beta = 0.020$, $p < 0.01$) but not role ambiguity ($\beta = -0.005$, $p > 0.05$), which is consistent with the correlation between the Interaction gap and role ambiguity results in **Table 2** ($\beta = -0.024$, $p > 0.05$) and 3 ($\beta = -0.011$, $p > 0.05$). In terms of the mediation effects of role conflict, **Tables 2, 3** suggest the potential difference between the samples of front-line and non-front-line social workers as

TABLE 2 | Means, SDs, and correlations for all variables in SEM of the Front-line sample.

	Mean ± SD	1	2	3	4	5	6
Emotional exhau.	12.37 ± 8.84	1.000					
Depersonalization	1.72 ± 0.11	0.523***	1.000				
RPA	16.26 ± 9.91	0.150***	0.211***	1.000			
Role conflict	24.06 ± 5.18	0.344***	0.285***	0.199***	1.000		
Role ambiguity	11.78 ± 2.60	0.214***	0.171***	0.260***	0.166***	1.000	
Interaction gap	−1.27 ± 1.21	−0.017	0.058**	0.066***	0.068***	−0.025	1.000

*p < 0.05, **p < 0.01, and ***p < 0.001.

TABLE 3 | Means, SDs, and correlations for all variables in SEM of the Non-front-line sample.

	Mean ± SD	1	2	3	4	5	6
Emotional exhau.	12.37 ± 8.81	1.000					
Depersonalization	1.71 ± 3.12	0.530***	1.000				
RPA	15.30 ± 10.00	0.196***	0.235***	1.000			
Role conflict	24.89 ± 5.60	0.349***	0.261***	0.219***	1.000		
Role ambiguity	11.19 ± 2.74	0.226***	0.184***	0.298***	0.212***	1.000	
Interaction gap	−0.65 ± 1.21	−0.012	0.006	0.048*	0.035	−0.011	1.000

*p < 0.05, **p < 0.01, and ***p < 0.001.

the correlation between the Interaction gap and role conflict is only significant for the front-line social worker sample (β = 0.076, p < 0.001). The result indicates that the mediation effects of role conflict are likely to be moderated by the variable of Non-front-line.

Before testing the hypothesized moderation part of the model in **Figure 1** by treating the variable of Non-front-line as the moderator, we separately tested the mediation model with the data of the front-line and the non-front-line social worker samples to reveal the direct, indirect and total effects for them. Results shows that the mediation models for both the front-line (RMSEA = 0.036 < 0.05, CFI = 0.917 > 0.9, and TLI = 0.909 > 0.9) and the non-front-line (RMSEA = 0.038 < 0.05, CFI = 0.911 > 0.9, and TLI = 0.903 > 0.9) social worker samples are well fitted. **Tables 5**, **6** illustrates those two sets of path analysis results respectively.

Table 5 shows that the government-client work interaction frequency gap directly affects two of the three indicators of front-line social workers' burnout. First, it has a significant direct negative influence on the emotional exhaustion of front-line social workers (β = −0.031, p < 0.05), indicating that those social workers involved in more work interaction with governments while less with clients have a lower level of emotional exhaustion after controlling for other factors. Meanwhile, the Interaction gap has a distinguished impact on the RPA of front-line social workers (β = 0.048, p < 0.01), suggesting that those social workers involved in more work interaction with governments while less with clients have a higher level of reduced personal accomplishment (i.e., lower level of personal accomplishment) after controlling for other factors. However, the effects of Interaction gap on depersonalization are not statistically significant (β = 0.016, p > 0.05).

In terms of the indirect influence, the path analysis in **Table 5** presents that the Interaction gap has indirect effects on all the

three burnout indicators of front-line social workers, whose coefficients are 0.019 (p < 0.01) on emotional exhaustion, 0.011 (p < 0.01) on depersonalization, and 0.016 (p < 0.05) on RPA. The indirect influence mainly takes effect through the mediator, role conflict, rather than role ambiguity. Results suggest that the Interaction gap is significantly associated with higher levels of role conflict (β = 0.024, p < 0.01), which, in turn, predicates higher levels of emotional exhaustion, depersonalization, and RPA. However, role ambiguity is not a significant mediator between the Interaction gap and the front-line social workers' burnout.

It should be noted that the directions of the direct and the indirect effects of the interaction gap on emotional exhaustion are opposite, which results in its weak and insignificant total effects (β = −0.012, p > 0.05).

Table 6 shows that only the direct and total effects of the Interaction gap on the RPA of non-front-line social workers are statistically significant, while the direct and total effects of the Interaction gap on the other two burnout indicators are not significant.

The results in **Table 6** are different from those for the front-line social workers, and especially all the three indirect effects are not significant for the non-front-line social workers. Comparing the results between **Tables 5**, **6**, we found that the association between the Interaction gap and the mediator Role conflict is only significant for the front-line sample (β = 0.024, p < 0.01) but not for the non-front-line sample (β = 0.006, p > 0.05). Therefore, we further tested whether the mediation effects of the Interaction gap have been moderated by the variable of Non-front-line (vs. Front-line as the reference).

According to the above results based on the data of two separate samples, we revised the moderated mediation model by treating the role ambiguity as one control variable rather than one of the mediators. **Figure 3** displays the standardized results of the

TABLE 4 | Standardized factor loadings of observed variables on latent construct.

Latent construct	Observed variables (Items)	Factor loading
Emotional exhaustion	I feel emotionally drained from my work.	0.691
	I feel used up at the end of the workday.	0.612
	Working directly with people puts too much stress...	0.674
	I feel I'm working too hard on my job.	0.753
	Working with people all day is really a strain for me.	0.727
	I feel like I'm at the end of my rope.	0.834
	I feel burned out from my work.	0.851
	I feel frustrated by my work.	0.816
	I feel fatigued when I get up in the morning and have…	0.604
Depersonalization	I've become more callous toward people since I took…	0.724
	I worry that this job is hardening me emotionally.	0.718
	I don't really care what happens to some recipients.	0.695
	I feel I treat some recipients as if they were impersonal …	0.657
	I feel recipients blame me for some of their problems.	0.713
RPA	I feel very energetic.	0.694
	I can easily understand how my recipients feel about things.	0.739
	I can easily create a relaxed atmosphere with my recipients.	0.767
	I feel exhilarated after working closely with my recipients.	0.816
	I have accomplished many worthwhile things in this job.	0.855
	I deal very effectively with the problems of my recipients.	0.868
	In my work, I deal with emotional problems very calmly.	0.806
	I feel I'm positively influencing other people's lives …	0.815
Role conflict	I receive an assignment without the proper manpower...	0.500
	I have to buck a rule or policy in order to carry out …	0.455
	I work with two or more groups that operate quite …	0.351
	I receive incompatible requests from two or more people.	0.561
	I do things that are apt to be accepted by one person and…	0.539
	I receive an assignment without adequate resources…	0.639
	I have to work on unnecessary things.	0.695
	Lack of policies and guidelines to help me.	0.725
	I work under incompatible policies and guidelines.	0.676
Role ambiguity	I feel certain about how much authority I have.	0.506
	Clear, planned goals exist for my job.	0.780
	I know that I have divided my time properly.	0.689
	I know what my responsibilities are.	0.833
	I know exactly what is expected of me.	0.615

revised model with the data of the full sample. This structural model has an adequate fit (RMSEA = 0.037 < 0.05, CFI = 0.909 > 0.9, and TLI = 0.901 > 0.9). The effects of the interaction

item between the Interaction gap and Non-front-line on the association between the Interaction gap and the mediator Role conflict is significant (β = −0.030, $p < 0.01$), which suggests that Non-front-line has moderated the above association.

In terms of the effects of control variables on the three burnout dimensions, the results suggest that: 1) the emotional exhaustion level of social wokers will be higher if they have a higher level of educational attainment (β = 0.039, $p < 0.05$) or more work hours per day (β = 0.046, $p < 0.001$), or work in a older organization (β = 0.010, $p < 0.024$), but be lower if they are older (β = −0.020, $p < 0.001$) or male (β = −0.120, $p < 0.001$); 2) their depersonalization level will be higher if they are male (β = 0.104, $p < 0.001$) but be lower if they are older (β = −0.020, $p < 0.001$); and 3) their RPA level will be lower if they have a higher level of educational attainment (β = −0.065, $p < 0.01$) or work in a organization with the autonomy of providing services outside the registered area (β = −0.130, $p < 0.001$).

DISCUSSION

This study investigated the effects of the gap between social workers' interaction frequency with governments and clients on their burnout by using the data collected from the CSWLS 2019, the first national survey for the social work profession in China. We also evaluated the mediating effects of role conflict and ambiguity and the moderating effects of non-front-line work. For the non-front-line social workers with extra management or supervision workload, the gap caused by more work interaction with governments and less with clients could only directly reduce social workers' personal accomplishments. However, for the front-line social workers, besides directly reducing personal accomplishment, the government-client work interaction frequency gap could indirectly neutralize its alleviating effects on emotional exhaustion, make its total effects on depersonalization significant, and reduce personal accomplishment further through increasing social workers' role conflict. That is to say, the mediating effects of role conflict are only significant for the front-line social workers but not for social workers with extra management or supervision workload, which reveals the moderating effects of non-front-line work. The findings of this study have implications for social policies and administration guidelines to form a healthy relationship between local governments and social work organizations. They are also an initial basis for psychological intervention and relevant course designs to get social work students and newly graduated social workers well prepared for the workplace.

First, this study establishes that only role conflict mediates the effects of social workers' government-client work interaction frequency gap on their burnout, while role ambiguity does not take effect as a mediator. Consistent with previous studies (32, 33, 35–37), role conflict and ambiguity significantly impact three dimensions of burnout. In addition, this study demonstrates that more work interaction with governments and less with clients is associated with a higher level of role conflict, which quantitative finding is consistent with the theoretical and qualitative investigations of previous research (45, 46).
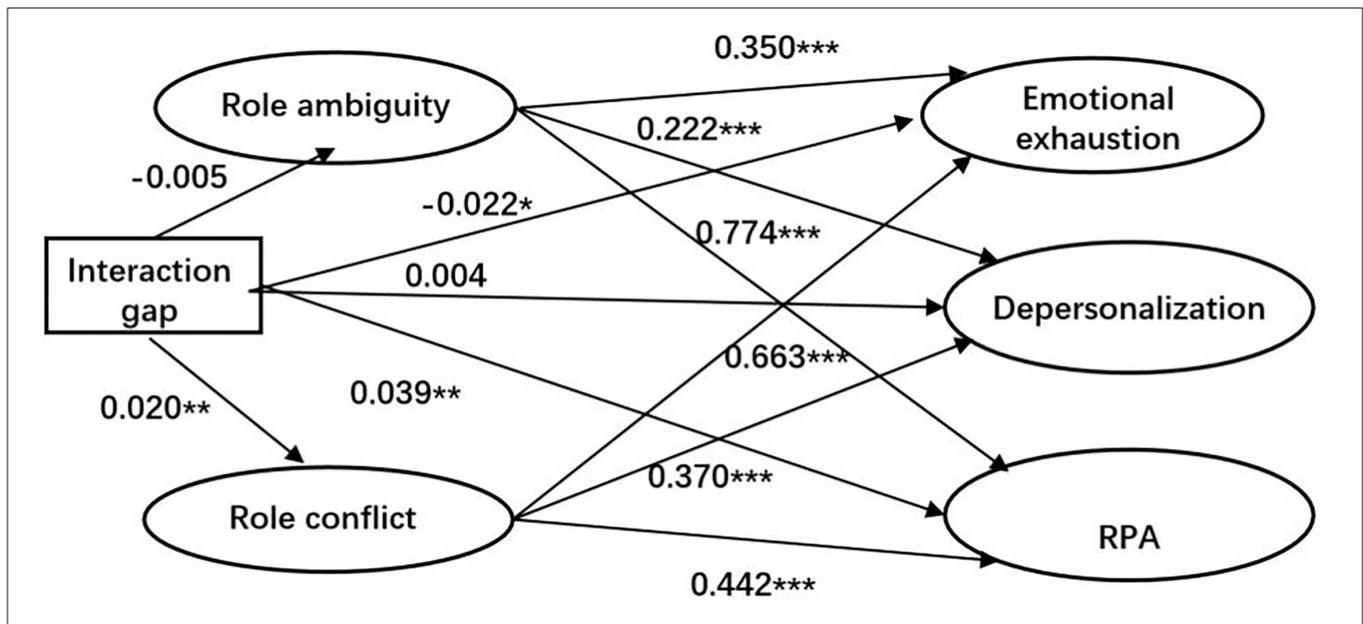
FIGURE 2 | Path coefficient model. *$p < 0.05$, **$p < 0.01$, and ***$p < 0.001$.

TABLE 5 | Standardized direct, indirect, and total effect and mediating effect ratio for the sample of front-line social workers.

Endogenous Var	Path	Exogenous Var	Direct effect Coef	Indirect effect Coef	Total effect Coef	Mediating effect ratio
Role ambiguity	←	Interaction gap	0.008 (0.201)		0.008 (0.201)	
Role conflict	←		0.020 (0.011)		0.020 (0.011)	
Emotional exhau.	←		−0.028 (0.036)	0.016 (0.003)	−0.012 (0.407)	−63.64 %
Depersonalization	←		0.017 (0.095)	0.010 (0.009)	0.027 (0.012)	37.03 %
RPA	←		0.050 (0.004)	0.015 (0.026)	0.065 (0.000)	23.08 %
Emotional exhau.	←	Role ambiguity	0.381 (0.000)		0.381 (0.000)	
Depersonalization	←		0.236 (0.000)		0.236 (0.000)	
RPA	←		0.820 (0.000)		0.820 (0.000)	
Emotional exhau.	←	Role conflict	0.672 (0.000)		0.672 (0.000)	
Depersonalization	←		0.409 (0.000)		0.409 (0.000)	
RPA	←		0.420 (0.000)		0.420 (0.000)	

P-value is in the parentheses. The word "path" mentioned in the first row of the talbes indicates the meaning of the arrow.

However, the association between the government-client work interaction frequency gap and the social worker's role ambiguity is insignificant. Further study on such a difference is necessary. One possible explanation could be as follows: after more than a decade of vigorous promotion by the government, social workers' participation in local government administrative and other work has been normalized or even standardized. Although the role conflict caused by different work ethics could still be deep-rooted, social workers could have been certain about the definition, expectation, responsibility, and task of working with local governments and clients simultaneously.

Second, this study demonstrates the significant moderating effects of non-front-line work on the association between the social workers' government-client work interaction frequency gap and the mediator of role conflict. Only the front-line

social workers' role conflict has indirect positive effects on their burnout. Although the above finding is new and quantitative, it is consistent with previous qualitative findings on the different roles in working with local governments played by the non-front-line social workers from the front-line ones in China (45, 52–55). Since social work supervisors and managers usually have the role of responding to the local governments as the primary funding body in China (55), they could get used to facing conflicting requirements or competing values at work. Thus, the government-client work interaction frequency gap would not significantly result in role conflict among them. However, this explanation requires further empirical investigation.

Third, although front-line social workers' role conflict facilitates the government-client work interaction frequency gap to increase all the three dimensions of their burnout indirectly,

Endogenous Var	Path	Exogenous Var.	Direct effect Coef.	Indirect effect Coef.	Total effect Coef.	Mediating effect ratio
Role ambiguity	←	Interaction gap	−0.001 (0.905)		−0.001 (0.905)	
Role conflict	←		0.007 (0.375)		0.007 (0.375)	
Emotional exhau.	←		−0.015 (0.306)	0.005 (0.479)	−0.010 (0.512)	/
Depersonalization	←		−0.005 (0.650)	0.003 (0.483)	−0.002 (0.841)	/
RPA	←		0.052 (0.006)	0.003 (0.683)	0.055 (0.006)	/
Emotional exhau.	←	Role ambiguity	0.318 (0.000)		0.318 (0.000)	
Depersonalization	←		0.189 (0.000)		0.189 (0.000)	
RPA	←		0.724 (0.000)		0.724 (0.000)	
Emotional exhau.	←	Role conflict	0.685 (0.000)		0.685 (0.000)	
Depersonalization	←		0.396 (0.000)		0.396 (0.000)	
RPA	←		0.523 (0.000)		0.523 (0.000)	

P-value is in the parentheses. The word "path" mentioned in the first row of the tables indicates the meaning of the arrow.
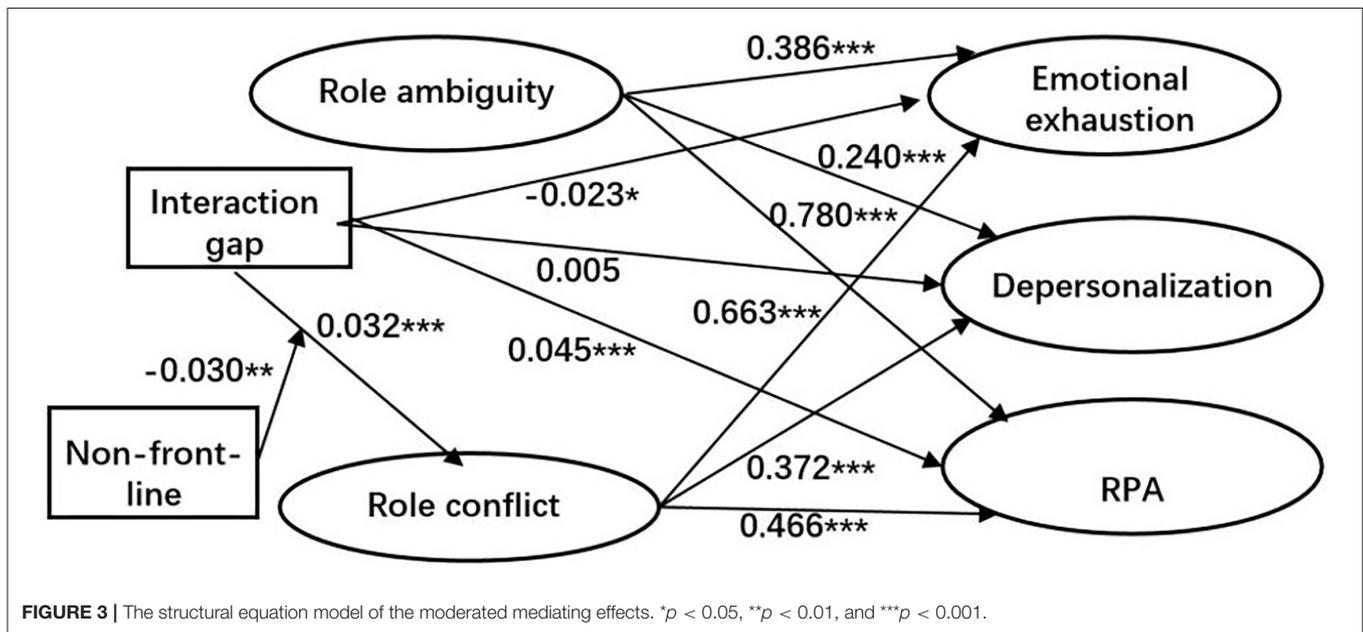

FIGURE 3 | The structural equation model of the moderated mediating effects. *$p < 0.05$, **$p < 0.01$, and ***$p < 0.001$.

we find the Interaction gap is different in its direct effects on those dimensions as follows: 1) significant negative on emotional exhaustion, 2) not significant on depersonalization, and 3) significant positive on reduced personal accomplishment, which results in its different total effects on those three dimensions. Such a difference is consistent with previous academic research on the components of the Maslach Burnout Inventory, whose three dimensions were psychologically discrete and represented different aspects of burnout (21, 38). However, regarding the specific effects of the Interaction gap, it is difficult to compare our results to previous research because there are few quantitative studies on the tension between working with governments and clients on social workers' burnout.

Based on the definition of those three dimensions of burnout (20, 70) and the observations of social workers' work in China (18, 43, 44, 47), we propose possible explanations

for its significant adverse effects on emotional exhaustion, which is different from our hypothesis and has a different effect direction from RPA. Previous research observed that social workers often conducted assistant administrative work for local governments (including quasi-government neighborhood committees) besides the professional social work for clients in China (43, 44). Regarding the administrative work commissioned by the government in China, it may have much less emotional demand (e.g., sympathy) from social workers than the "typical" social work services for the clients, most of whom are underprivileged. Thus, the social worker who has more work interaction with governments and less with clients could feel less overextended and depleted of one's emotional resources. However, compared to the typical social work services, which usually help underprivileged children, seniors, and disabled people directly, the administrative

work commissioned by governments may give the social workers much less immediate positive feedback. Therefore, the social worker who has more work interaction with governments and less with clients may be more likely to negatively evaluate the achievements at work and feel reduced personal accomplishment.

Regarding the insignificant effects of the Interaction gap on depersonalization, we could consider that long-term administrative work may make those social workers actively ignore the qualities that make the service recipients unique—for example, regarding the recipients as a number in statistics. Such an effect on depersonalization may be no different from the effects of highly stressed professional social work. Further research should investigate the above assumptions.

Several limitations should be acknowledged. First, as only the first wave of the CSWLS was conducted, this study was based on cross-sectional data, which limited our ability to determine causal relationships between independent and dependent variables. The present study's findings should be tested further using the data from the future waves of the CSWLS. Second, the tension between working with governments and clients was not measured directly, and it should include more dimensions related to social workers' investment in work, such as energy and brainpower, besides time. However, due to the data limitation, this paper only investigated the deviation in the time-allocation priority measured by asking social workers' frequency level of work interaction with contract-issuing government departments and the one with clients separately and then calculating the gap between the two levels. More specific direct and multi-dimensional measures of the above tension should be implemented in future research. Third, in order to provide more feasible practical implications, further investigations should be focused on finding some protective factors (e.g., personal resilience, work conditions, and organizational cultures) to mitigate (negative moderate) the effects of the tension between working with governments and clients on role conflict and in turn reduce social worker's burnout. We hope the following waves of the CSWLS or other similar projects can provide relevant data for those studies. Nevertheless, our study provides preliminary but significant evidence to show the vital role of the tension between working with governments and clients in increasing social workers' burnout.

CONCLUSION

This study reveals that front-line social workers in China who have more work interaction with contract-issuing government departments and less with clients could have a higher level of role conflict, and the role conflict then could increase their vocational burnout. However, such an association does not apply to social workers with extra management or supervision workload. In order to reduce burnout in social workers, social

work educational programs should include adequate mental adjustment courses and practical emplacement to prepare students for the potential role conflict in the workplace. As Chinese social work organizations' reliance on governments will not be significantly changed soon, social work education should prepare students to understand the local knowledge of Chinese social work, which could be different from the knowledge they learned from western textbooks. In addition, front-line social workers should be involved in the management and supervision work as least as an assistant in their early career as soon as possible, which could help them understand the organization's relationship with governments better and thus reduce their role conflict. At the policy level, the professionalization of social work has been promoted significantly in China but still requires more policy support. Local governments should treat social workers as partners rather than clerks, which would benefit social workers' mental health and the government's social governance. Therefore, higher-level governments should issue relevant regulations and administration guidelines on contracting out social services to form a collaborative rather than an employment relationship between local governments and social worker organizations.

DATA AVAILABILITY STATEMENT

The datasets China Social Work Longitudinal Study 2019 for this study can be acquired by sending the application to the email address of the study's organizer, the East China University of Science and Technology (ECUST): issw@mail.ecust.edu.cn.

ETHICS STATEMENT

The studies (CSWLS) involving human participants were reviewed and approved by the research Ethics Committee of the East China University of Science and Technology that the corresponding author is affiliated with the Ethics Committee of the first author's university Sun Yat-sen University approved the research protocol of this article. The participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

JW designed this study and was responsible for data analysis and writing. ZT guided the study design and interpretations, was responsible for data access, and supported the writing. JL supported the data analysis. QW assisted in writing the literature review. All authors approved the final paper.

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Does Giving and Receiving Helping Behavior Fit Matter? The Role of Neighboring Behavior Fit in Working Residents' Mental Health

Jing Xiu[1], Zhenduo Zhang[2]*, Youqing Fan[3] and Junwei Zheng[4]

[1] School of Applied Economics, University of Chinese Academy of Sciences, Beijing, China, [2] School of Economics and Management, Dalian University of Technology, Dalian, China, [3] School of Business, Western Sydney University, Sydney, NSW, Australia, [4] Faculty of Civil Engineering and Mechanics, Kunming University of Science and Technology, Kunming, China

Ecological systems theory suggests that for individuals, the three domains of community, family, and work are connected and transfer resources among each other. In the community, residents receive and give helping behavior from and to their neighbors. Neighboring behavior underlies interactions among residents in the community, thereby influencing the work and family domains. Building on ecological systems theory, the authors propose that the compatibility of receiving and giving helping behavior among working residents is related to their mental health. Additionally, the authors propose that this congruence effect functions through work-family interference and meaning in life. Using a two-stage field questionnaire survey, this study collected data from 220 full-time Chinese working residents. Using polynomial regression and response surface analysis, receiving-giving neighboring behavior fit was found to be positively associated with mental health. Furthermore, receiving-giving neighboring behavior fit enhances mental health by decreasing work-family interference and promoting meaning in life. When giving and receiving neighboring behavior are imbalanced, working residents have higher levels of mental health when they received more neighboring behavior than they gave, in comparison to the condition when they gave more neighboring behavior than they received. Work-family interference represents inter-role conflict in which pressures from the family and work domains are mutually incompatible. Including both work to family interference and family to work interference, work-family interferences reflect the stress that working residents experience in their family and work domains. By exploring the mediating role of work-family interference, this study shows how the spillover of the benefits of neighboring behavior into the family and work domains enhances working residents' mental health. This study highlights the importance of balancing receiving and giving neighboring behavior for maintaining mental health, thus contributing both theoretically and practically to ecological systems theory.

Keywords: receiving neighboring behavior, giving neighboring behavior, work-family interference, labile self-esteem, mental health

INTRODUCTION

Communities are considered to be places where social capital and psychological resources are cultivated to maintain mental health (1, 2). Perkins et al. (3) put forward the concept of neighboring behavior, representing both the receiving and giving of various kinds of assistance from and to neighbors. Neighboring behavior aims to resolve and prevent both current and potential related problems, such as coping with emergencies and seeking advice to resolve personal problems. Compared with the physical community environment, Zhang et al. (4, 5) and Zu et al. (6) highlighted the benefits of informal mutual assistance and information sharing among neighbors in maintaining and enhancing residents' mental health.

With increasing work pace, employees are facing increasing stress from both the work and family domains. In particular, the disruption caused by the COVID-19 pandemic and the widespread use of information communication technologies has resulted in most employees choosing to work from home and adopting teleworking (7). This choice provides employees with autonomy in scheduling their tasks (8) but stimulates enhanced work-family interference. Hunter et al. suggest that working from home results in boundary violations between work and family, thereby leading to work-family interference (9). Organizational psychology scholars have attempted to develop strategies for resolving this dilemma via enhancing family-supportive supervision, nurturing leader compassion, and decreasing technology overload and invasion (10–12). Only a few studies have focused on the influences of neighboring behavior on resolving work-family interference and maintaining mental health (4, 6).

Although prior studies have addressed the benefits brought by receiving and giving neighboring behavior on enhancing mental health, the reciprocal nature of neighboring behavior should be further addressed (13). Social exchange theory and reciprocal norms drive residents to provide support to their neighbors after having received assistance from them. Moreover, prosocial behavior has been identified as causing negative side effects for actors (14). For example, Gabriel et al. showed that helping behavior may result in ego depletion in helpers (15). Zhang et al. suggested that the potential reason for the detrimental effects of prosocial behavior may be the neglect of the resources owned by helpers (5). In the community context, Voydanoff (16, 17) suggested that helping neighbors is a commandment for working residents. The reason for this is that helping neighbors requires working residents to devote time to communicating with their neighbors and aiding them in resolving related problems. As a result, less time is available for working residents to recover from their work fatigue. Receiving neighboring behavior is a resource for working residents, which develops social adaptability and prevents mental illness (1, 18). Exploring the influences on mental health of (in)congruencies in receiving and giving neighboring behavior provides a novel perspective to explain both the shortcomings and advantages of neighboring behavior. It can also provide a potential explanation for the formerly paradoxical relationship between giving neighboring behavior and mental health. Therefore, it is necessary to explore the joint influences of receiving and giving neighboring behavior, specifically the fit between them, on mental health.

Furthermore, the current study adopts work-family interference and meaning in life as chain mediators to explore how receiving and giving neighboring behavior fit impacts mental health. Ecological systems theory provides a theoretical framework for analysing the spillover effects of neighboring behavior on psychological states in both the work and family domains (1). Ecological systems theory suggests that community, work, and family are three basic components of the personal ecological systems, which transfer resources and energies among each other. This transformation of resources plays a key role in shaping individuals' mental health (5). Receiving and giving neighboring behavior fit represents the extent to which working residents' receiving and giving neighboring behavior match. A higher level of such a fit provides working residents with ample community resources, which can spill over into their family domains. Therefore, this study adopts work to family interference and family to work interference to uncover the underlying spillover mechanism through which receiving and giving neighboring behavior fit affects mental health. Meaning in life is essential for individuals to maintain mental health and has been used as a mediator in the relationship between work-family interference and mental health (19, 20). Based on prior studies, this study further adopts meaning in life to link work-family interference to mental health.

Ecological systems theory suggests that personality traits shape the spillover process in which community resources are transferred to the work and family domains (4). Labile self-esteem is one of the basic personality traits associated with psychological syndromes such as depression and anxiety (21). In this vein, this study adopts labile self-esteem as a boundary condition to assess when receiving and giving neighboring behavior fit is beneficial for enhancing mental health. The conceptual model is depicted in **Figure 1**.

To test the conceptual model, the present study employed a two-wave field questionnaire survey and collected data from 220 full-time Chinese working residents. Polynomial regression with surface response analysis was employed to explore the impacts of giving and receiving neighboring behavior fit on mental health. By doing so, this study provides three contributions to both neighboring behavior theory and ecological systems theory. First, this study extends our understanding of the antecedents of mental health by examining the impacts of receiving and giving neighboring behavior fit on mental health. Second, this study uncovers the spillover process through which receiving and giving neighboring behavior fit enhances mental health by examining the serial mediating roles of work-family interference and meaning in life. Third, this study explores the boundary condition under which receiving and giving neighboring behavior fit is more or less beneficial for facilitating mental health by examining the moderating role of labile self-esteem.

FIGURE 1 | Conceptual Model.
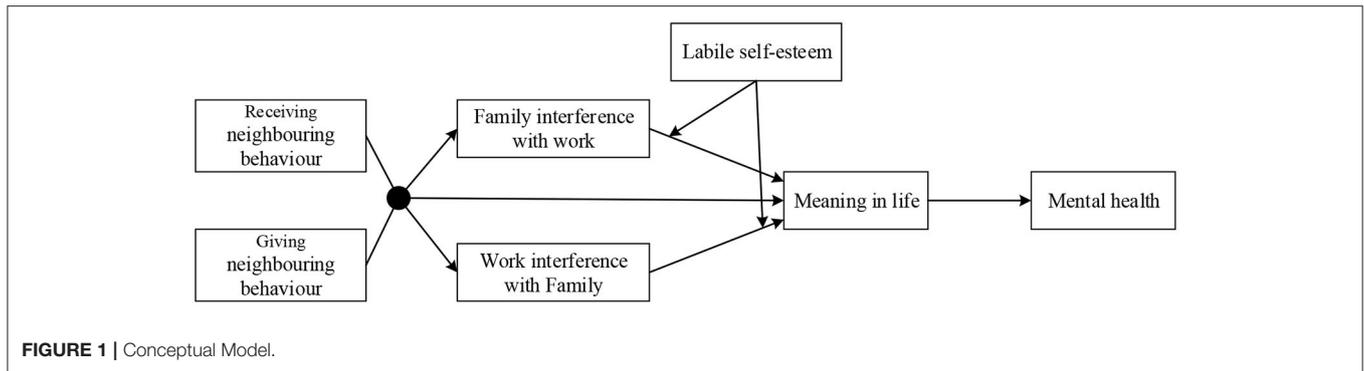
LITERATURE REVIEW AND HYPOTHESIS DEVELOPMENT

Congruence in Receiving and Giving Neighboring Behavior and Mental Health

Receiving neighboring behavior reflects the amount of assistance obtained from neighbors when confronted with difficulties (3). Prior studies have highlighted the benefits of receiving neighboring behavior on mental health. For instance, Zu et al. suggested that assistance from neighbors will relieve work-family conflicts, thereby enhancing mental health (22). Giving neighboring behavior is a process in which residents spend time helping others to resolve problems in the community (4). Recently, the giving of neighboring behavior has been highlighted as an effective tool for cultivating community resources. Zhang et al. explored the relationship between the giving of neighboring behavior and social functioning (5). Research suggests that helping neighbors rewards the helpers with cognitive information processing abilities and enhances emotional regulation skills (5), both of which are essential for maintaining mental health.

Integrating the above statements, the authors assume that when receiving and giving neighboring behavior are highly congruent, residents both receive support from neighbors and obtain resources by helping their neighbors. Under this context, residents have sufficient resources, such as social capital and positive emotions, to enable them to maintain their mental health. Because of a low level of receiving neighboring behavior, such residents are less likely to receive social and psychological resources from the community when confronted with difficulties. They have no extra access to social support and psychological resources, which leads to an increased risk of mental illness. Due to the low level of giving neighboring behavior, working residents cannot cultivate good reputations and favorable social relationships. These working residents are usually unfamiliar with their neighbors and more likely to experience mental illness due to a lack of social interactions (3). As a result, when the congruence in receiving and giving neighboring behavior is at a low level, residents are usually not involved in the community and are isolated from their neighbors, which is not beneficial for them to maintain their mental health. Hence, the following is hypothesized:

Hypothesis 1. *Residents have a higher level of mental health when their congruence in receiving and giving helping behavior is at a high rather than a low level.*

Incongruence in Receiving and Giving Neighboring Behavior and Mental Health

As aforementioned, helping behavior from neighbors helps residents to release stress associated with their daily life and work. For example, Griggs et al. (1) highlighted the importance of community support for attenuating work-family conflict for low-income workers. Supporting this, Zu et al. (22) suggested that support from neighbors may help low-income residents to cope with work-family conflict, thereby enhancing their mental health and career satisfaction.

With regard to giving neighboring behavior, prior studies have highlighted both its advantageous and disadvantageous influences on psychological and behavioral responses. Giving neighboring behavior is beneficial because it provides helpers with enhanced social functioning, which is essential for maintaining mental health (5). Recently, several scholars have begun to focus on the negative aspects of helping behavior. Helping behavior entails individuals assigning some of their time to assist others in resolving and preventing difficulties (23). Time is a limited resource in any day (15). This means that helpers face a trade-off between completing their own tasks and helping others with their limited time. Thus, when residents consume time and other resources (e.g., cognitive and emotional resources) to help their neighbors, they are more likely to experience ego depletion (15), which is detrimental to their mental health (24).

In the aggregate, when receiving and giving neighboring behavior are imbalanced in either direction, residents will present different levels of mental health. In the condition of giving high levels of neighboring behavior while receiving low levels of neighboring behavior, residents both experience the advantages and disadvantages of helping their neighbors. In particular, residents suffer from the loss of time and other resources without benefitting from resource supplementation (i.e., receiving neighboring behavior). Under this condition, residents are more likely to suffer lower levels of mental health because of ego depletion. Under the condition of receiving high levels of neighboring behavior while giving low levels

of neighboring behavior, residents receive support from their neighbors but extend little effort to help others, even though the cultivation of social support would aid them in maintaining their mental health. Hence, the following is hypothesized:

Hypothesis 2. *Residents have a higher level of mental health when they receive a higher level but give a lower level of neighboring behavior compared with those who receive a lower level but give a higher level of neighboring behavior.*

Serial Mediating Roles of Work-Family Interference and Meaning in Life
Receiving and Giving Neighboring Behavior Fit and Work-Family Interference

Work-family interference represents a form of inter-role interference in which stress from work and stress from family play mutually incompatible roles (25). Work-family interference arises when one's ability cannot satisfy one's need to cope with both work and family demands (26). When working residents are distracted from their work by family-related responsibilities, they are experiencing family interference with work (27). By contrast, work interference with the family occurs when participation in the family role becomes more difficult because of participation in work (28). Community resources can be transferred to the family and work domains and are therefore important for resolving work-family interference.

Family demands include physical duties like fixing or repairing the home (task aspects), making family-related decisions (cognitive aspects) and taking care of a spouse, children, and parents (relational aspects) (29). Receiving neighboring behavior includes receiving help in an emergency and receiving advice on family-related matters, both of which are beneficial to fulfilling family roles (1). Also, such community resources can be delivered into the work domain. Receiving neighboring behavior nurtures residents' well-being, which can spill over into their work role and enhance their positive emotions, thereby broadening their behavioral and cognitive repertories available for fulfilling their work roles (6).

Regarding giving neighboring behavior, Zhang et al. (5) suggested that helping neighbors is a process in which working residents develop social functioning (i.e., cognitive information processing abilities and emotional regulation skills). Social functioning allows working residents to adapt their emotions to the current satiation to cope with emotional demands at work and in the family (5). Social functioning helps working residents to fulfill demands from the work and family domains through assertive communication and time management with family members or leaders (1). Thus, a high level of giving neighboring behavior facilitates the fulfillment of both work and family roles.

Taken together, when working residents experience a high level of receiving and giving neighboring behavior fit, they receive sufficient community resources (e.g., positive emotions, advice, and care) for delivery into the family and work domains. These resources facilitate working residents' fulfillment of their work and family role demands, thereby decreasing the likelihood they will experience work-family interference. Hence, the following is hypothesized:

Hypothesis 3. *Receiving and giving neighboring behavior fit is negatively associated with work-family interference (i.e., family interference with work and work interference with family).*

Work-Family Interference and Meaning in Life

Meaning in life represents the sense made of, and significance felt regarding, the nature of one's being and existence (30). Moreover, Steger et al. identified coherence, purpose, and existential mattering as the three basic precursors of meaning in life (30). Based on this perspective, the psychological antecedents of meaning in life have been extended. Among the other psychological factors involved, positive emotions and psychological capital have received particular attention.

As aforementioned, work-family interference arises when family or work demands exceed one's capabilities (31). When confronted with work-family interference, working residents are more likely to experience emotional strain because of the consistent drain of psychological resources (32). Nauman et al. explored the positive association between work-family interference and emotional exhaustion (33). Hicks and King suggested that positive mood is a cue for individuals to make judgements about meaning in life (34). Thus, decreased positive mood caused by work-family interference undermines working residents' judgements about their meaning in life. Psychological capital is a further psychological factor that can impact meaning in life. Psychological capital enables individuals to evaluate life events positively and thus causes them to experience higher meaning in life (35). However, Pu et al. suggested that work-family interference consumes work residents' psychological capital, thereby decreasing meaning in life (36). Taken together, the following is hypothesized:

Hypothesis 4. *Work-family conflict is negatively associated with meaning in life.*

Meaning in Life and Mental Health

The relationship between meaning in life and mental health has attracted attention from scholars. For example, Shiah et al. examined the positive relationship between meaning in life and mental health in a non-clinical sample of Chinese participants (20). Li et al. found that happiness and meaning in life are two key indicators of mental health as they ameliorate perceived stress (37). Prior studies have suggested that meaning in life is one of the strongest motivations and provides people with hope when they are confronted with adversity (38). Psychological resources are obtained from meaning in life and facilitate coping with personal traumas and maintaining mental health. As such, the following is hypothesized:

Hypothesis 5. *Meaning in life is positively associated with mental health.*

Taken together, the authors assume that receiving and giving neighboring behavior provides working residents with the community resources needed to fulfill the demands imposed by work and family roles, thereby decreasing their likelihood of experiencing work-family interference. As a result, these working residents have more positive cues

when making judgements about meaning in life, which is beneficial for enhancing mental health. Thus, the following is hypothesized:

> **Hypothesis 6.** *Work-family interference and meaning in life serially mediate the relationship between receiving and giving neighboring behavior fit and mental health.*

Moderating Role of Labile Self-Esteem

Zhang et al. suggested that the spillover processes through which community resources are delivered into the work and family domains are contingent upon personal traits (4). Moreover, Kinnunen et al. found that the association between work-family conflict and psychological well-being depends on personality (39). To better understand the boundary conditions under which receiving and giving neighboring behavior fit is beneficial for mental health, this study assumes labile self-esteem to be a moderator in the relationship between work-family interference and meaning in life, in light of its impacts on psychological well-being.

Labile self-esteem reflects an individual's tendency to experience fluctuations in their level of self-esteem (40). In contrast to self-esteem, people with a high level of labile self-esteem are more likely to shift the perception they hold of themselves, thereby exposing themselves to increased risks for depressive symptoms. Roberts and Monroe found that persons with high labile self-esteem exhibit a special sensitivity to stress (41). Moreover, Roberts and Kassel found that individuals with high self-esteem have a higher likelihood of experiencing life stress (42). Work-family interference is commonly regarded as a hindrance stressor, which consistently consumes working residents' job resources and results in decreased meaning in life (43, 44). Given the increased sensitivity to stress caused by a higher level of labile self-esteem, work-family interference exerts strong negative impacts on meaning in life for working residents with a high level of labile self-esteem. By contrast, working residents with a low level of labile self-esteem tend to cope with stress proactively and are less likely to be impacted by it. Thus, work-family interference is less detrimental to meaning in life for working residents with low levels of labile self-esteem. Hence, the following is hypothesized:

> **Hypothesis 7.** *Labile self-esteem moderates the relationship between work-family interference (i.e., family interference with work and work interference with family) and meaning in life in such a way that the relationship between work-family interference and meaning in life is stronger in working residents with high rather than low levels of labile self-esteem.*
>
> **Hypothesis 8.** *Labile self-esteem moderates the indirect relationship between receiving and giving neighboring behavior and mental health in such a way that the indirect relationship between receiving and giving neighboring behavior fit and mental health is stronger in working residents with high rather than low levels of labile self-esteem.*

METHODS

Sampling and Procedures

This research focuses on the impacts of receiving and giving neighboring behavior fit on mental health through work-family interference and meaning in life. Two criteria for samples were set: having full-time jobs and having lived in the current communities for over 1 year. Samples were chosen randomly from people living in urban communities in Harbin City, China. With the assistance of trained social workers, questionnaires were sent out in hard copies. To control for common method variance, this study adopted a lagged questionnaire survey and collected data at two time points. The first time point was on 1st November 2018. Neighboring behavior (i.e., receiving and giving neighboring behavior) and work-family interference (i.e., family interference with work and work interference with family) were surveyed at this time point. The second time point occurred on 16th December 2018, and both meaning in life and mental health were surveyed at this time point.

A total of 317 surveys were collected in the first wave, and 220 surveys in the second wave. The effective response rate was 69%. The results of drop-out analysis indicated that the dropped samples exhibited an insignificant difference from the retained samples in regard to neighboring behavior, work-family interference, meaning in life, and mental health. Respondents worked in diverse industries (e.g., governments, manufacturing, and internet companies). On average, they were 41.26 ($\pm$ 9.60) years old and had 21.77 ($\pm$ 11.26) years of work experience. 41.4% of the respondents were male, and 78.6% were married. Regarding their education level, 19.1% of the samples had senior school education and below, 38.6% had high school education, 27.3% had a college education, and 15.9% had a bachelor's degree.

Measures

All scales were originally developed in English and were translated into Chinese. To ensure their validity, the back-translation procedure suggested by Brislin was employed (45). A five-point Likert scale was used ranging from 1 = *strongly disagree* to 5 = *strongly agree* without special statements.

Neighboring Behavior

Ten items developed by Perkins et al. (3) were used to measure neighboring behavior. This scale included two dimensions: receiving neighboring behavior (five items) and giving neighboring behavior (five items). A sample item for receiving neighboring behavior is, "My neighbors help me in an emergency." The Cronbach's α for this scale was 0.82 in the current study. A sample item for giving neighboring behavior is, "I help my neighbors in an emergency." The Cronbach's α for this scale was 0.77 in the current study. A five-point Likert scale was used for the frequency with 1 = *almost never* and 5 = *always*.

Mental Health

Mental health was assessed via 12 items of the GHQ-12 validated by Gao et al. (46) in Chinese samples. A sample item is, "I am able to concentrate." The Cronbach's α was 0.96 in the current study.

TABLE 1 | Results of descriptive statistics.

Variables	Group	N	%
Gender	Male	91	41.40
	Female	129	58.60
Education	Senior School	42	19.10
	High School	85	38.60
	College	50	22.70
	Bachelor	35	15.90
	Master and above	8	3.60
Marital sStatus	Married	173	78.60
	Others	47	21.40

Work-family interference. Eight items developed by Grzywacz and Marks (47) were used to assess work-family interference. Family interference with work was measured by four items. A sample item is, "Stress at home makes me irritable at work". The Cronbach's α for this scale was 0.96 in the current study. Work interference with family was measured by four items. A sample item is, "Stress at work makes me irritable at home." The Cronbach's α for this scale was 0.95 in the current study.

Meaning in life. This study used five items in presence of meaning subscale developed by Steger et al. (30) and suggested by Crego et al. (48). A sample item is, "I understand my life's meaning." The Cronbach's α was 0.89 in the current study.

Labile Self-Esteem

This study used five items developed by Dykman (49) to measure labile self-esteem. A sample item is, "Compared to most people, my self-esteem changes rapidly." The Cronbach's α was 0.96 in the current study.

Control Variables

Considering the potential influences on mental health, the statistical analysis employed in this study controlled for gender, age, educational level, and marital status (50–52). Gender is a dichotomous variable for which 1 = *male* and 2 = *female*. Age is a continuous variable and respondents reported their age directly. Educational level is a categorical variable where 1 = *senior school degree*, 2 = *high school degree*, 3 = *college degree*, 4 = *bachelor's degree*, and 5 = *master's degree and above*. Marital status is a dichotomous variable where 1 = *married* and 2 = *other*.

RESULTS

Results of Descriptive Statistics

The distribution of demographic information is depicted in **Table 1**. Furthermore, we have calculated the means, standard deviations, and correlations between the focal variables. Theses results are shown in **Table 2**.

Analysis Strategy

Polynomial regression with response surface analysis was adopted to test the hypotheses (53). This statistical method has been employed by researchers in the fields of psychology and

management to explore how the combination of two independent variables is related to one dependent variable, particularly in the case of congruence and discrepancy measures (54). Dawson suggested that this approach is superior to traditional regression analysis because polynomial regression analysis can provide a three-dimensional view of the interactive influence of two predictors on one dependent variable (55).

The classical polynomial regression equation is $Z = b_0 + b_1X + b_2Y + b_3X^2 + b_4XY + b_5Y^2 + e$. In this equation, Z is the dependent variable (mental health), X represents giving neighboring behavior, and Y represents receiving neighboring behavior. In the response surface analysis, coefficients in the polynomial regression are used to examine the response surface pattern, which is depicted to provide a three-dimensional visual representation of the data for the interpretation of the polynomial regression results (56). The surface pattern was determined by the slope and curvature of the congruence line (X = Y) and the incongruence line (X = -Y). For Hypotheses 3 through 8, to assess the moderated mediation effect on the relationship between receiving and giving neighboring behavior fit and mental health, Edwards and Cable's (57) approach was followed first. A block variable that combined the five polynomial terms (X, Y, XY, X2, and Y2) was calculated based on their respective weights in the polynomial regression analysis (58). Then, path analysis was conducted to examine the moderated mediation model by using Mplus 7.4.

Following Edwards's (57) suggestions, X and Y were centered. To test Hypothesis 1, it was determined whether the slope along the congruence line (X = Y) was significantly positive. This would indicate that mental health increased as giving and receiving neighboring behavior matched at higher levels rather than lower levels. Regarding Hypothesis 2, it was determined whether the slope along the incongruence line (X = –Y) was significantly negative. Such a result would indicate that the working residents' mental health was better under the condition of lower giving neighboring behavior with higher receiving neighboring behavior rather than higher giving but lower receiving neighboring behavior.

Hypothesis Testing

Polynomial regression analysis was used to determine how congruence and incongruence in receiving and giving neighboring behavior affect mental health. This analysis was conducted in Mplus 7.4. The results of Model 2 (**Table 3**) indicate a negative association between giving neighboring behavior and mental health ($\beta = -0.40$, $p < 0.01$). However, the association between receiving neighboring behavior and mental health was significantly positive ($\beta = 0.96$, $p < 0.01$).

To test both H1 and H2, response surface analysis was used and the response surface pattern was examined based on the curvature and slopes of the congruence and incongruence lines. The results shown in **Table 3** indicate that the slopes of the congruence line (x = y) ($\beta = 0.56$, $SE = 0.08$, $p < 0.01$) and the incongruence line (x = –y) ($\beta = -1.35$, $SE = 0.38$, $p < 0.01$) are significant. The positive slope of the congruence line indicates that mental health was higher when giving and receiving helping behavior were congruent at higher

TABLE 2 | Results of correlation analysis.

	1	2	3	4	5	6	7	8	9	10	11
1.Gender											
2.Age	0.02										
3.Marital Status	0.08	−0.30**									
4.Education	−0.07	−0.28**	0.12								
5.Giving Neighboring Behavior	0.04	−0.03	0.16*	0.14*	(0.77)						
6.Receiving Neighboring Behavior	0.03	−0.05	0.15*	0.22**	0.71**	(0.82)					
7.Family Interference with Work	0.06	0.18**	−0.07	−0.46**	−0.31**	−0.35**	(0.96)				
8.Work Interference with Family	0.02	0.09	−0.04	−0.18**	−0.41**	−0.41**	0.33**	(0.95)			
9.Meaning in Life	−0.09	−0.09	0.08	0.27**	0.37**	0.47**	−0.37**	−0.34**	(0.89)		
10.Mental Health	−0.06	−0.07	0.06	0.37**	0.43**	0.55**	−0.41**	−0.41**	0.67**	(0.96)	
11.Labile Self-Esteem	0.08	0.08	−0.03	−0.17*	0.07	−0.02	0.05	0.07	−0.58**	−0.57**	(0.96)
Mean		41.26			1.87	1.87	3.45	2.52	3.24	3.15	2.96
SD		9.60			0.58	0.66	1.09	0.95	0.82	0.82	1.00

N = 220; **p < 0.01, *p < 0.05; Values in the parentheses are Cronbach's Alpha.

TABLE 3 | Results of polynomial regression with response surface analysis.

	Mental health			
	Model 1		Model 2	
	B	SE	B	SE
Constant	2.17	0.36	1.69	0.33
Gender	−0.07	0.11	−0.10	0.09
Age	0.08	0.12	0.04	0.10
Marital education	0.07	0.13	−0.04	0.12
Education	0.63**	0.11	0.41**	0.10
Giving neighboring behavior (X)			−0.40**	0.21
Receiving neighboring behavior (Y)			0.96**	0.18
X^2			−0.29	0.61
XY			0.01	0.94
Y^2			0.16	0.42
F	8.86**		15.53**	
R^2	0.14		0.40	
ΔR^2			0.26**	
Slope along x = y			0.56**	0.08
Curvature on x = y			−0.13	0.15
Slope along x = -y			−1.35**	0.38
Curvature on x = -y			−0.15	1.19

N = 220; **p < 0.01.

levels. This supports Hypothesis 1. The negative slope of the incongruence line indicates that mental health was higher in the condition when working residents received much but gave little neighboring behavior compared to those who gave much but received little neighboring behavior. This supports Hypothesis 2. To interpret the results holistically, coefficient estimates, standard errors, and covariances in the polynomial regression analysis were used. The overall response surface within the data range was plotted by adopting the method developed by Shanock et al. (59) (see **Figure 2**).

To assess the underlying spillover process that links community resources to mental health, this study used a block variable approach as specified by Edward and Cable (57) to test hypotheses H3–H6. The results are shown in **Figure 3**. Receiving and giving neighboring behavior fit was negatively correlated with both family interference with work ($\beta = -0.36$, $p < 0.01$) and work interference with family ($\beta = -0.39$, $p < 0.01$). This supports Hypothesis 3. Family interference with work ($\beta = -0.19$, $p < 0.01$) and work interference with family ($\beta = -0.12$, $p < 0.01$) were negatively associated with meaning in life. This supports Hypothesis 4. Meaning in life was positively associated with mental health ($\beta = 0.77$, $p < 0.01$), which supports Hypothesis 5.

To test hypothesis 6, a bootstrapping test was adopted, the results of which are shown in **Table 4**. The serial mediating effect was significant for both the family interference with work path (Effect = 0.11, SE = 0.03, 95%CI = [0.06, 0.18]) and the work interference with family path (Effect = 0.08, SE = 0.03, 95%CI = [0.03, 0.14]).

To test Hypotheses 7 and 8, two interactive items were added to the path analysis. The interactive item of labile self-esteem with family interference with work was significant ($\beta = -0.19$, $p < 0.01$). A simple slope test was further conducted to assess the moderating effect. The results indicate that the negative influence of family interference with work on meaning in life emerged for working residents with high labile self-esteem (Effect = −0.28, SE = 0.04, 95%CI = [−0.35, −0.21]). The moderating effect of labile self-esteem in the relationship between family interference with work and meaning in life is shown in **Figure 4**.

The interactive item of labile self-esteem with work interference with family was significant ($\beta = -0.07$, $p < 0.05$). A simple slope test was further conducted to assess the moderating effect. The results indicate that a negative influence of work interference with family on meaning in life affected working residents with high labile self-esteem (Effect = −0.17, SE = 0.04, 95%CI = [−0.25, −0.08]). The moderating effect of labile self-esteem in the relationship between work interference
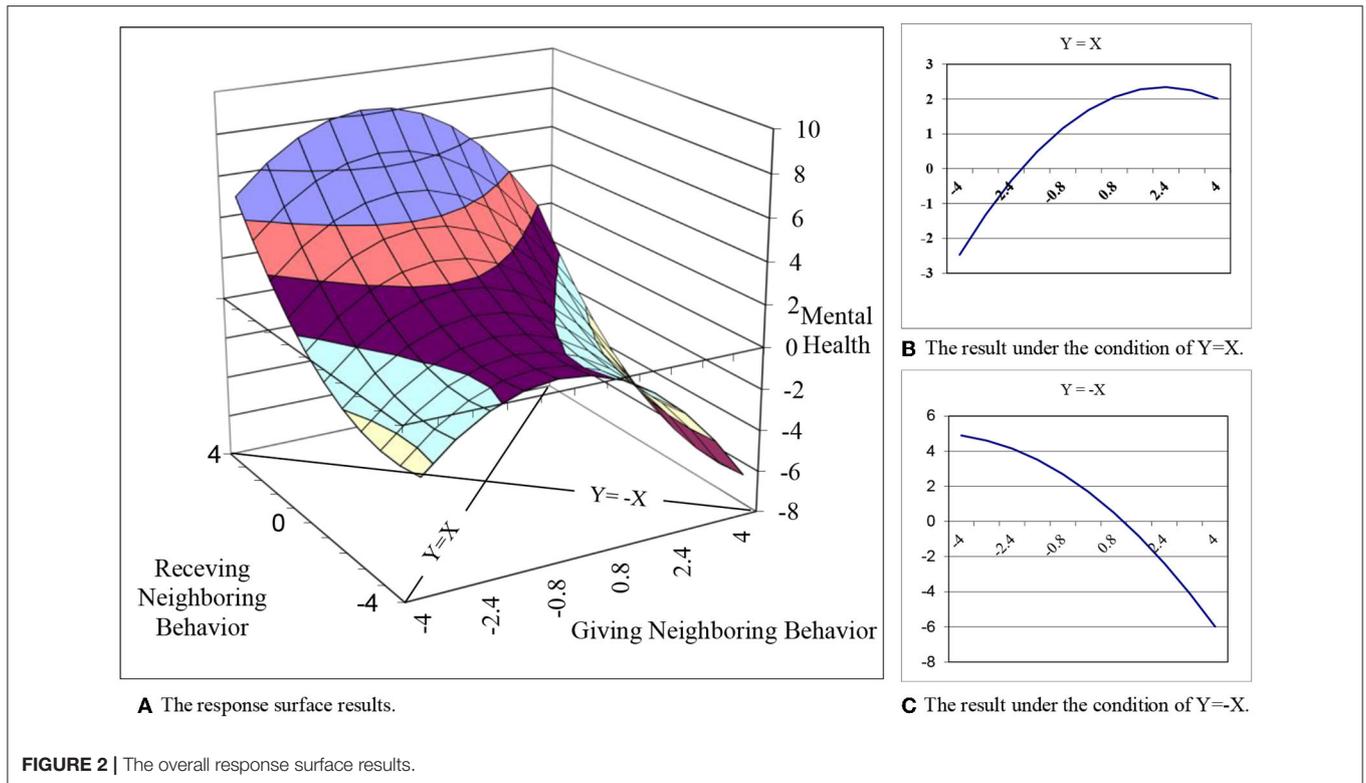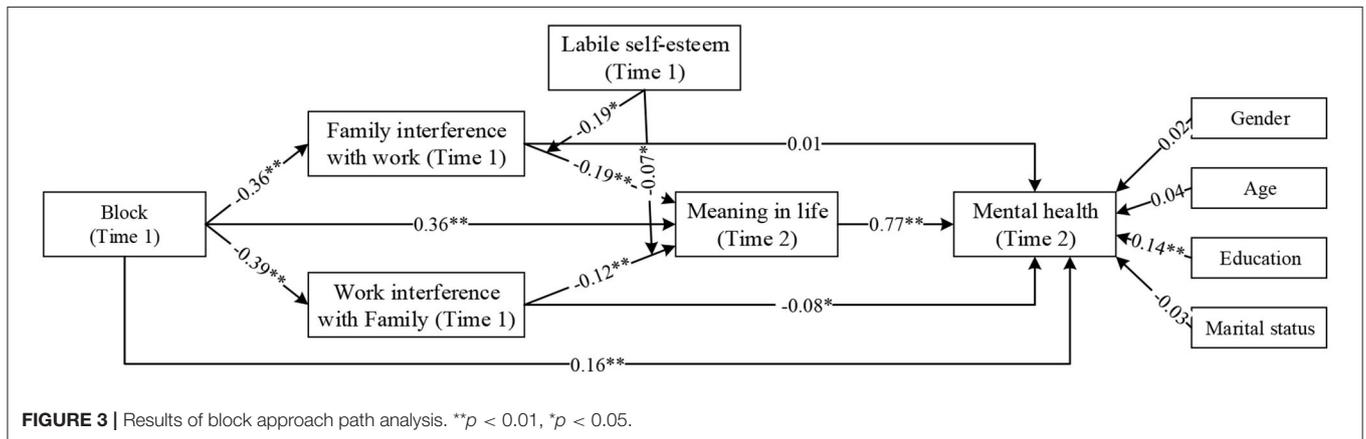
FIGURE 2 | The overall response surface results.

FIGURE 3 | Results of block approach path analysis. **$p < 0.01$, *$p < 0.05$.

with family and meaning in life is shown in **Figure 4**. This supports Hypothesis 7.

Furthermore, the moderated mediation model was examined through bootstrapping tests. The results shown in **Table 4** indicate that the indirect effect of giving and receiving neighboring behavior fit on mental health through the family interference with work path affected working residents with high labile self-esteem (Effect = 0.23, SE = 0.05, 95%CI = [0.13, 0.33]). Also, the indirect effect of giving and receiving neighboring behavior fit on mental health through the work interference with family path affected working residents with high labile self-esteem (Effect = 0.13, SE = 0.04, 95%CI = [0.06, 0.21]).

DISCUSSION

Based on ecological systems theory, this paper explores how both congruence and incongruence of receiving and giving neighboring behavior impact mental health. By employing polynomial regression and response surface analysis, this study found that working residents have a higher level of mental health when receiving and giving behavior are highly congruent. When receiving and giving neighboring behavior are imbalanced, it is better for working residents to receive rather than give neighboring behavior in order to maintain their mental health. Furthermore, this paper explored the serial mediating roles of work-family interference and meaning in life in the relationship
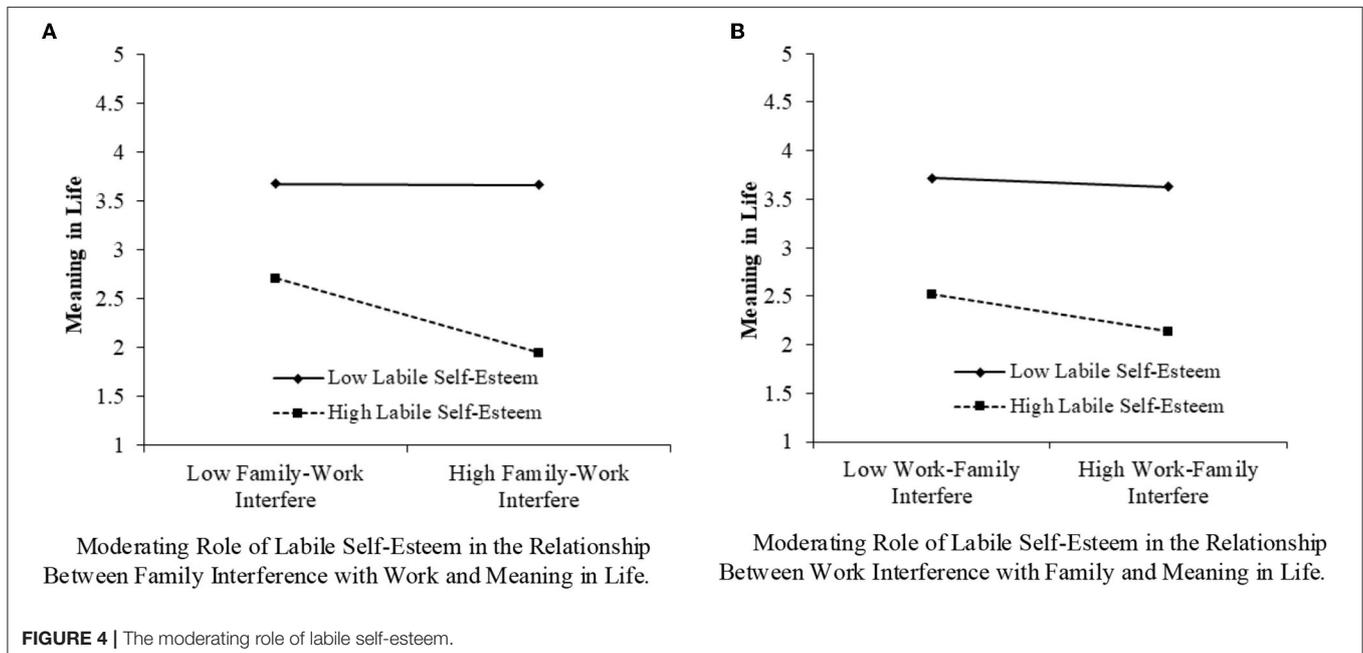
between receiving and giving neighboring behavior fit and mental health. However, one result should be further explained. Polynomial regression analysis indicated that when mental health was regressed on receiving and giving neighboring behavior

TABLE 4 | Results of bootstrapping analysis.

			Confidence interval	
	Effect	SE	95%LL	95%UL
Mediation effect				
Family interference with work path	0.11	0.03	0.06	0.18
Work interference with family path	0.08	0.03	0.03	0.14
Moderated effect of labile self-esteem				
Family interference with work to meaning in life				
Low labile self-esteem (M-SD)	−0.01	0.04	−0.08	0.06
High labile self-esteem (M+SD)	−0.28	0.04	−0.35	−0.21
Difference	−0.27	0.05	−0.37	−0.18
Work interference with family to meaning in life				
Low labile self-esteem (M-SD)	−0.04	0.04	−0.12	0.05
High labile self-esteem (M+SD)	−0.17	0.04	−0.25	−0.08
Difference	−0.13	0.06	−0.24	−0.02
Moderated meditation model				
Family interference with work path				
Low labile self-esteem (M-SD)	0.00	0.03	−0.05	0.06
High labile self-esteem (M+SD)	0.23	0.05	0.13	0.33
Difference	0.22	0.06	0.12	0.34
Work interference with family path				
Low labile self-esteem (M-SD)	0.03	0.03	−0.04	0.09
High labile self-esteem (M+SD)	0.13	0.04	0.06	0.21
Difference	0.10	0.05	0.01	0.20

simultaneously, the receiving of neighboring behavior was positively associated with mental health. This is in line with prior studies demonstrating the positive influences of community support. However, the association between giving neighboring behavior and mental health was negative, which is not consistent with the findings of Zhang et al. (5). Voydanoff (15, 16) regarded the giving of neighboring behavior as a demand. Although giving neighboring behavior may yield social functioning for working residents, it also potentially occupies their time and cognitive capabilities and undermines their recovery experiences. In particular, when the resources they received from their living communities, namely receiving neighboring behavior, were controlled, the negative aspect of giving neighboring behavior emerged.

This study offers three contributions to the literature. First, this study explores the relationship between receiving and giving neighboring behavior fit and mental health, thus extending our understanding of the antecedents of mental health in the community. Prior studies have explored how giving neighboring behavior impacts mental health. Zhang et al. (5) indicated that working residents can realize self-development by helping neighbors. Their research suggests that social functioning is developed in the process of helping neighbors, thereby conveying capabilities that can be used to reduce work-family conflict and facilitate thriving at work. In addition to the positive aspects of neighboring behavior, its positive association with ego depletion has also been reported (15, 60). A potential explanation for these inconsistent results may be the neglect of working residents' receiving neighboring behavior. Giving neighboring behavior is interpersonal and reciprocal (61). It acts as an effective tool for cultivating social capital. Driven by norms of reciprocity, neighbors are motivated to provide support for focal working residents. Moreover, Zu et al. indicated the

Moderating Role of Labile Self-Esteem in the Relationship Between Family Interference with Work and Meaning in Life.

Moderating Role of Labile Self-Esteem in the Relationship Between Work Interference with Family and Meaning in Life.

FIGURE 4 | The moderating role of labile self-esteem.

benefits of receiving neighboring behavior in relieving work-family conflicts and facilitating mental health (22). Therefore, this paper explored how receiving and giving neighboring behavior fit impacts mental health. Our results explain the paradoxical results from prior studies on giving neighboring behavior and provide a research paradigm for this stream of research.

Second, this paper uncovers the spillover process by which receiving and giving neighboring behavior fit impacts mental health by examining the serial mediating roles of work-family interference and meaning in life. Ecological systems theory suggests that resources are mobile and can be transferred to other domains. For example, Zhang et al. explored how community resources are transferred into the family and work domains (5). Following this logic, this study focused on two paths: the family interference with work path and the work interference with family path. These two paths reflect how community resources (i.e., neighboring behavior) are transferred into the family and work domains, respectively (1, 62). The results indicate that resources aggregated by neighboring behavior can be used to fulfill the demands of working residents' work and family roles, thereby enhancing both their meaning in life and mental health. Based on prior studies, this research replicated the spillover effect suggested by Griggs et al. (1) and Zhang et al. (4) that links receiving neighboring behavior and mental health. Moreover, this study extended this line of research by introducing congruence and incongruence in receiving and giving neighboring behavior as indicators of community resources.

Third, this study revealed the boundary condition under which community resources can be adopted to resolve work-family interference and enhance mental health. Most studies developed within the framework of ecological systems theory have regarded personality traits as moderators. In line with prior studies, this study introduced labile self-esteem into the transformation process of community resources. Labile self-esteem reflects the instability of self-esteem, which is commonly regarded as an indicator of depressive symptoms (63). As mentioned previously, individuals with labile self-esteem are more likely to be impacted by stressors (41). This paper verifies that working residents with high labile self-esteem are more sensitive to stress. Bakker and Demerouti suggested that job resources help employees who are experiencing high levels of job demands (64). The present study found that receiving and giving neighboring behavior fit can be used as a resource to fulfill both work and family demands in working residents with high labile self-esteem. By doing so, this study extended the study of Bakker and Demerouti (64) by determining when community resources are beneficial for working residents to maintain their mental health.

In summary, this study provides a novel perspective for discussing the association between neighboring behavior and mental health within the framework of ecological systems theory. Prior studies have mainly explored the influences of receiving and giving neighboring behavior on mental health separately. By instead examining receiving and giving neighboring behavior fit, this study specified the conditions under which neighboring behavior provides or consumes psychological resources. Furthermore, this study revealed the family (family interference with work) and work (work interferences family) paths through which community resources cultivated by neighboring behavior can be transformed to nurture mental health. Moreover, this study demonstrated the key role of labile self-esteem in shaping this spillover process. In doing so, this research contributes to ecological systems theory by applying it to explain how and when neighboring behavior is beneficial for mental health.

Furthermore, the results of this research have several practical implications. This study indicated that when both the receiving and giving of neighboring behavior are at a high rather than a low level, working residents have higher levels of mental health. When receiving and giving neighboring behavior are imbalanced, working residents only have higher levels of mental health in the condition of receiving high levels of neighboring behavior while giving low levels of neighboring behavior. These results suggest that reciprocal interactions between neighbors in the community are beneficial. For managers of communities, community activating measures should be hosted by professional social workers to provide a platform for working residents to interact with each other and build social networks. To avoid work-family interference, social workers should also provide social support to working residents, thereby increasing their meaning in life and mental health. Moreover, these results indicate that the influences of (in)congruence in receiving and giving neighboring behavior on mental health are contingent upon labile self-esteem. To undermine the buffering role of labile self-esteem, managers may present lectures concerning self-compassion and mindfulness to help working residents maintain stable self-esteem (21, 65).

Limitations and Future Research

The current study has several limitations that point to the following directions for future research. First, this study could not establish firm causal relationships. Receiving and giving neighboring behavior were not manipulated. Therefore, the causal impact of receiving and giving neighboring behavior fit on mental health could not be inferred. Future research may adopt an experimental design and cross-lagged panel design to overcome this shortcoming.

Second, this study could not rule out common method variance [CMV; (66)]. Although a two-wave questionnaire survey design was adopted, CMV still led to potential bias in the results. The employed questionnaires were self-reported and more than one questionnaire was completed at the same time point (e.g., meaning in life and mental health). This may have introduced CMV bias into the results. Future research may adopt a multi-source survey design or objective data to avoid CMV. For example, giving neighboring behavior can be assessed by neighbors.

Third, this study was conducted within Chinese communities, which limits external validity. Collectivism culture is

widespread in China (67), resulting in more widespread interactions between neighbors, especially among older working residents. Future research may replicate this study in different age groups and explore differences between Chinese and Western cultures.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by Dalian University of Technology. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

JX contributed to supervision and funding acquisstion. ZZ performed the statistical analysis and wrote the first draft of the manuscript. YF contributed to the supervision of the study. JZ contributed to the design and data curation of the study. All authors contributed to manuscript revision, read, and approved the submitted version.

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Is It so Severe for Social Entrepreneurship in a Transitional Economy? The Role of Work-Related Wellbeing and Political Connection in Shaping the Exit Intention

Jianing Dong [1,2], Xiao Wang [1,2]*, Xuanwei Cao [1,2] and David Higgins [2]

[1] *International Business School Suzhou, Xi'an Jiaotong-Liverpool University, Suzhou, China,* [2] *Management School, University of Liverpool, Liverpool, United Kingdom*

In the context of a transitional economy, there are much more studies with a heroic characterization of social entrepreneurs, whereas there is limited exploration of their less positive stories. A range of studies tried to address this issue, although very few delved into the "inner layer" (work-related mental health) to unveil the mechanism of how social entrepreneurs develop their intention to quit their businesses. With a sample of 196 social business owners from China, this research focuses on the prosocial motivation of social entrepreneurs as well as its impacts on their work-related wellbeing and thus their business exit intention. With the partial least squares structural equation modeling, this research finds that prosocial motivation decreased entrepreneurs' partial work-related wellbeing, increasing their exit intention, and the mediating effects among the three components of work-related wellbeing were different. Furthermore, this research finds that work-related wellbeing's impact on exit intention was largely stronger for the social entrepreneurs without political connections.

Keywords: social entrepreneur, entrepreneurial exit intention, prosocial motivation, transitional economy, work-related wellbeing, political connection

INTRODUCTION

Exiting decision is an inevitable component of the entrepreneurial process and central to entrepreneurial decision-making research (1–4). When entrepreneurs are confronted with pressures, they will more or less decide whether to persist or pull the plug and exit the business (5–7). Nevertheless, very little research has attempted to document or investigate it (4, 8–10). This is particularly prominent in social entrepreneurship research, somewhat owing to the excessive heroic characterization of a social entrepreneur highlighting their success in improving people's lives, compared to the limited concerns on their less positive stories (11, 12). As it is much more common for an entrepreneur, especially a social entrepreneur, to cease his or her business, while the success is rare and hardly replicable, conducting in-depth research on the entrepreneurial failure becomes rather necessary and meaningful (12).

One of the research directions that arouses great interest in social entrepreneurial exit decision is how it occurs in the context of a transitional economy (12–14). Although we know that institutional environments imply constraints, incentives, and resources

jointly affecting entrepreneurs and their activities (12, 15, 16), how exactly social entrepreneurship is affected is rarely empirically investigated (12–14). Moreover, scholars highlighted that current studies deficiently unveil how institutions interplay with social entrepreneurship generally and in non-US and non-Western institutional contexts (14, 17). Therefore, narrowing those gaps by investigating the exit of social entrepreneurs in the institutional context of a transitional economy can substantially contribute to the comprehensive understanding of social entrepreneurship.

As a psychological antecedent of entrepreneurial exit, the typical personality trait of social entrepreneurs—prosocial motivation, has attracted increasing research interest (12, 18). However, current research findings on the relationship between prosocial motivation and entrepreneurial exit are controversial. On the one hand, Mcmullen and Bergman (19), as well as Cardon and Wincent (20), suggested that the feelings of commitment toward their ventures (as "their babies") evoked by prosocial motivation can impede their exit. On the other hand, Renko (20) as well as Wennberg, Wiklunc (21) indicated a contradictory view that social entrepreneurs are less likely to be successful in developing a viable firm than the entrepreneurs who are mainly motivated by financial goals, inevitably leading to their exit.

Addressing the debate above, scholars suggest introducing a mediator that can play an essential role in the relationship between prosocial motivation and exit intention (22, 23) for two reasons. First, it might be simplistic to investigate whether prosocial motivation will determine entrepreneurial exit; rather, with a zoomed-in lens, before taking the substantial step of ceasing a business, there can be both expediting and impeding intentions around such a step (24, 25). Thus, in-depth research is needed. Second, as failure is relatively common for entrepreneurship and even more for social entrepreneurship, due to the commitment to both economic and social value creation (26), exit intention is rather critical and hardly ignorable (19, 20). Previous research has indicated that work-related attitudes can be such a mediating variable between personality traits (in this research: prosocial motivation) and job-related outcomes (in this research: exit intention) (23), while work-related wellbeing essentially indicates a pervasive and persistent attitude (positive or negative) toward job or job situation (27–30).

In addition to the work-related wellbeing, in the context of a transitional economy, the impacts of response to and interaction with the environment can be hardly ignored as well. Although the transitional economy's institutional environment is unsupportive to social business (14, 27), several social enterprises have successfully emerged in such a context in China (14, 27). This somewhat challenges the predominant view on the relationship between institutional environment and entrepreneurial exit intention (28–30), assuming that the latter is uniformly impacted by the former. Nevertheless, firms' linkages with institutional authorities are diverse and heterogeneous (31, 32). This type of difference in political connections thus somewhat alters how entrepreneurs respond to the institutional environment of a transitional economy, which in turn, implies another research gap: how social entrepreneurs' divergent political connections affect their exit intention in the context of a transitional economy (12–14).

Accordingly, with a sample of 196 social entrepreneurs in China and the method of PLS-SEM (33) operated by SmartPLS (v.3.3.3), this research investigated how their prosocial motivation affects their exit intention mediated by work-related wellbeing (three dimensions: job satisfaction, work anxiety, and work burnout) in the context of a transitional economy, and how political connections can alter those impacts. The findings indicate that job satisfaction and work anxiety separately mediates prosocial motivation's effect on exit intention, while the mediating effects of work burnout is not significant. Moreover, we find that political connection moderates most of the relationships between work-related wellbeing and exit intention: job satisfaction and work anxiety's effects on exit intention are stronger for the social entrepreneurs without political connections than the ones with political connections, while the moderating effect of political connection on the relationship between work burnout and exit intention is insignificant.

The findings of this study imply three contributions. First, it furthers the researches on the relationship between prosocial motivation and exit intention (19, 20, 34) by unveiling the role of social entrepreneurs' work-related wellbeing and by extending our understanding on what types of work-related wellbeing influence their exit intention. Second, it discusses the necessity of involving political connection in further understanding of the relationship between prosocial motivation and work-related wellbeing as well as its effect on social entrepreneurs' exit intention in the context of a transitional economy. Third, it supplements the knowledge about how social entrepreneurs can increase their success rate in the context of a transitional economy, although this context can be rather different from and harsher than the one of a developed economy (35).

THEORETICAL BACKGROUND AND HYPOTHESIS DEVELOPMENT

Allport (36) and Eysenck (37) suggested the hierarchical approach to personality provides a structural basis for integrating personality traits, situations, and behavioral intentions of individuals. One of the key assumptions of the hierarchical approach is that personality flows from higher to lower levels of the hierarchy, leading to behavioral intentions of individuals (36, 37). At the higher level of the hierarchy are the basic personality traits (38), while at the lower level are the surface traits, which are more specific and have a significant effect on behavioral intention.

Basic personality traits are an enduring disposition that originate from genetics and early learning history (38), while surface traits are an enduring disposition to behave in a specific context. Mowen and Spears (39) claim that a situation's potential requirement, such as the role demands of a job as a server in a restaurant, exerts pressures on people to shape a subjective pattern for behaving in such a situation.

Researchers including Licata, Mowen (40)Licata, Mowen (41), Brown, Tom (42) and Prentice and King (43) suggest that: basic

personality traits and contextual elements jointly impact surface traits that eventually affect behavioral intentions of individuals.

Following the hierarchical approach to personality (36, 37), prosocial motivation, "the desire to benefit others or expend effort out of concern for others," is regarded as a basic personality trait and represents "a person's 'affective lens' (remains constant over the time) on the world" (44–46). Work-related wellbeing, a pervasive and persistent attitude (positive or negative) toward one's job or job situation, is normally regarded as a type of surface personality traits, jointly developed by prosocial motivation and contextual features (in this research: transitional economy) (47–50).

Largely, a transitional economy was typically under central planning by the government and is now becoming market-oriented (40). It mostly adopts various types and levels of pro-market reforms to decentralize and limit the state's control in market, privatize property rights, reduce industry entry barriers and minimize governmental intervention in resource allocation (51). However, this transition cannot be achieved with one step; normally, it takes a long journey with various defects in fostering entrepreneurship (52, 53). For example, despite the gradualism of marketization in China, the delay in granting full rights to private entrepreneurs largely reflects ideological rigidity and institutional inertia against changes (54). As a result, the regulation systems are still weak and the political uncertainties surrounding businesses are relatively high (52, 53). Largely, in a transitional economy, social entrepreneurship can be hardly supported and facilitated, due to the survival-oriented or short-term culture, incomplete institutional arrangement for supportive resource allocation, and ambiguous policy and administrative procedures (15, 55, 56). Thus, their work-related wellbeing based on prosocial motivation is likely affected negatively. Indubitably, social entrepreneurs cannot be just impacted by the environment without any reaction and thus interaction with it (15, 56). This, in turn, may alter the degree of their work-related wellbeing's influence on their intention to exit social entrepreneurship.

Mostly, work-related wellbeing includes three dimensions: job satisfaction, work burnout, and work anxiety (57–65), indicating an attitude (positive or negative) to rank one's job or job situation (47–50). The three dimensions seem interrelated, but they can be independent of each other (66). For example, people may regard their work as difficult and demanding (low job satisfaction) and may suffer from performance anxiety (high anxiety), but still feel enthusiastic (low burnout) about their work (67). With the three dimensions of work-related wellbeing, we are able to disentangle the impact mechanism between prosocial motivation and exit intention via each of the dimensions.

Prosocial Motivation, Job Satisfaction and Exit Intention

Job satisfaction is commonly defined as an attitudinal evaluative judgment of one's job or job experiences (68). In a transitional economy, prioritizing the values and beliefs of materialism can cause high levels of social injustice and disparity in wealth derived from the unjust social conditions, creating a society that is socially ill and ethically apathetic (69). The local opinion leaders, key stakeholders, or communities may form values, beliefs and hopes incongruent with the ones of entrepreneurs with prosocial motivation (70). Moreover, the distorted values and beliefs may weaken the formal institutions' efficacy and incubate a propensity for the public to be less concerned about the impact of ethical or responsible social behaviors without guilt (69). Under such a circumstance, social entrepreneurs' original intentions, values and implications can be hardly recognized and comprehended, furthering potential conflicts with the local opinion leaders, key stakeholders or communities. This can transform the entrepreneurs with prosocial motivation into a minority, impeding solution development for the social problems and eventually diminishing their job satisfaction (14, 71, 72). Grounded in the relationship between job satisfaction and exit intention, turnover theory suggests that a lower level of job satisfaction can cause a higher level of exit intention (73), as low-level job satisfaction implies that individuals will decrease their commitment to work and doubt their career choice. When one's job satisfaction deviates from his or her expectation, lower job satisfaction provides immediate aversive feedback to avoid pain from the work (29, 74, 75), resulting in low-level productivity and high-level absence and expediting higher exit intention (76, 77). Hence, prosocial motivation can incur extra burdens and pertinent pressures (78, 79), decreasing job satisfaction. And the weakened job satisfaction can undermine their job productivity and efficacy, as the social entrepreneurs may negatively interpret their works, and even start to doubt their work's values and social identity (29, 74, 75). To avoid a worse situation, they may choose latent escape and job absence, fostering their exit intention. Therefore, this research hypothesizes:

Hypothesis1a: Prosocial motivation is negatively related to job satisfaction.
Hypothesis1b: Job satisfaction mediates the relationship between prosocial motivation and entrepreneurial exit intention.

Prosocial Motivation, Work Anxiety and Exit Intention

Work anxiety is defined as an emotional state of perceived apprehension and increased distress (80, 81), and characterized by worry and uneasiness about one's job performance (82). In a transitional economy, social ventures often face tensions related to scarcity of resources, especially financial resources (83, 84). For instance, the unaddressed issues about the ideological status of social enterprises in China can engender considerable uncertainties for decisions on policies such as tax exemptions and subsidies (85). This institutional ambiguity created by administrative inaction can undermine the critical legitimacy, support, and resources that can enhance social ventures' survival (86). For example, as there is no legal framework for social enterprises in a transitional economy mostly, financial institutions mostly do not lend money to this kind of organizations of which the priority is not profitability (87–90). However, given that adequate income and financial support is a buffer against anxiety and psychological strain of running a business (91), social entrepreneurs who suffer from income issues and scarcity of financial resources may develop

anxiety since their strong commitment to a social business can be jeopardized (92–94). Meanwhile, work anxiety creates feelings of tension, potentially affecting the entire work process and even the outcome (95). Furthermore, this tension prompted by work anxiety can be converted into affective rumination (95), inducing escape from the work for the psychological restoration (95–97). Hence, when the work anxiety stemming from the contradiction between their strong commitment to social businesses and financial hardship increases, they may develop more feelings of tensions that can be transformed into stronger willingness to escape from their current works for the psychological restoration, increasing their intention to quit the social business. Therefore, this research hypothesizes:

> *Hypothesis2a: Prosocial motivation is positively related to work anxiety.*
> *Hypothesis2b: Work anxiety mediates the relationship between prosocial motivation and entrepreneurial exit intention.*

Prosocial Motivation, Work Burnout and Exit Intention

Work burnout refers to the condition of physical and emotional exhaustion, as well as the associated negative attitudes resulting from the intensive interaction with the people at work (98). On the one hand, in a transitional economy, the non-supportive and unclear rules and regulations plus the fear of violating them increase the psychological burden of running a social enterprise (14). Besides, social entrepreneurs need to respond to relatively more governmental bureaucracy and political uncertainty in a transitional economy (27, 99, 100). This not only can impair the potential capacity to obtain resources to pursue both the economic and prosocial targets (3, 45), but also can create a tension between unsupportive and unclear regulations and entrepreneurial activities. On the other hand, through the process of social entrepreneurship in a transitional economy, social entrepreneurs are trying to stimulate a re-evaluation of the social values stemming from the institutions or non-institutions and retrieve the prosocial values (101). But attempts to alter the prevailing social values by introducing alternate values are often associated with confrontational approaches and tension between the alternate values and the dominant norms and values of communities and larger societies (88, 102). As a result, the tension between social entrepreneurship and non-supportive and unclear regulations, together with the tension between the alternate values and dominant norms and values, engender a burnout experience (103–105). Individuals who feel burnout at work are less likely to be satisfied and more likely to make a change (106), including work termination. Several studies have provided evidence that burnout is strongly associated with work withdrawal behavior. High levels of work burnout, which in turn, can be transformed into counterproductive behaviors (e.g., turnover, absenteeism, etc.). Hence, social entrepreneurs who feel burnout are more likely to become unsatisfied and counterproductive, which in turn, may induce withdrawal behaviors (107, 108) and even disengagement from the venture with consideration of leaving or exiting the social business entirely (109). Therefore, this research hypothesizes:

> *Hypothesis3a: Prosocial motivation is positively related to work burnout.*
> *Hypothesis3b: Work burnout mediates the relationship between prosocial motivation and entrepreneurial exit intention.*

Entrepreneur's Political Connection as a Moderator

Prior studies claim that in transitional economies, social mechanisms (e.g., social networks, kinship networks) can be employed to buffer the negative effects on entrepreneurship caused by institutional deficiencies (28, 54, 110). Given the significant role of government and political authorities in transitional economies, political connections (as a social mechanism) are likely to be perceived as indispensable (27), potentially moderating the effects of social entrepreneurs' work-related wellbeing on their exit intention.

In a transitional economy that prioritizes materialism's values and beliefs, prosocial values and motivation can hardly be recognized by local opinion leaders, key stakeholders or communities, leading to lower job satisfaction and thus higher exit intention (70). But the political connections of social entrepreneurs may weaken the negative relationship between job satisfaction and exit intention. In transitional economies, local governments can be a critical source of information related to social entrepreneurial opportunities, and political connections can serve as informational cues to help identify such opportunities, drawing the social entrepreneurs' attention to the unaddressed social issues (111, 112), and thus confining their negative sense-making due to the impaired job satisfaction (29, 74, 75). Therefore, the negative effect of weakened job satisfaction on exit intention can be ameliorated.

In addition, previous research claims that in the context of an emerging economy, social entrepreneurs may develop anxiety because they need to respond to the lack of critical legitimacy, support, and resources resulting from the institutional ambiguity (86). Although such work anxiety can cause an increase in exit intention due to the tension between their commitment and the difficulties as well as their potential affective rumination (92–94), political connections may provide entrepreneurs a sense of security in a such a context (27). Given the incompletely developed market mechanism and resourceful government, political connections may help attain access to more information and details about the social entrepreneurs' peers or similar entrepreneurs and how they sustain their businesses (113, 114). Those complete or partial stories can inspire the social entrepreneurs with weakened work anxiety, encouraging them to learn from the stories (115, 116). This, in turn, can somewhat mitigate the tension and even affective rumination, thus alleviate the negative effect of work anxiety on exit intention.

Prior studies revealed that social entrepreneurs need to respond to considerable governmental bureaucracy and political uncertainty in a transitional economy (99, 100), stimulating work burnout (103–105) and subsequent entrepreneurial exit (107–109). But the political connections of social entrepreneurs may counteract this effect. Based on the reciprocity principle in political connections, both sides will have to benefit each
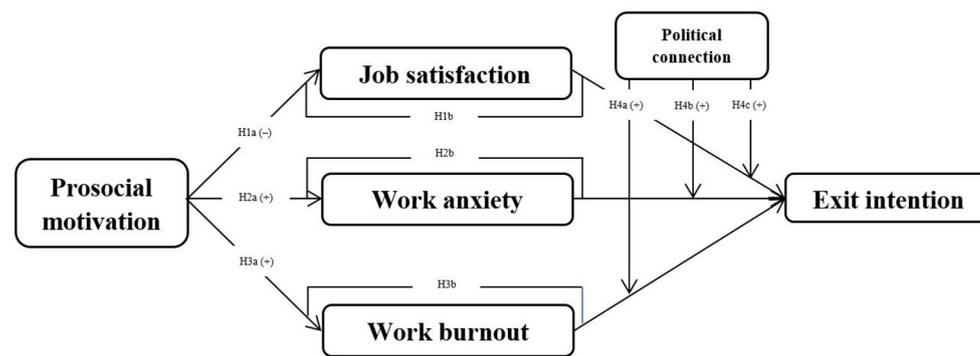
FIGURE 1 | Theoretical model.

other to sustain the relationship (99). In transitional economies, the government normally does not have sufficient resources to engage in social welfare projects (117), thus the reciprocity principle in political connections implies possible congruence and entanglement between the government and social enterprises in terms of "doing good" (99, 118). Accordingly, this reciprocal and continuous relationship can facilitate social entrepreneurs considering potential favorable actions of the government besides simply quitting their businesses, when they feel work burnout caused by the aforementioned bureaucracy and political uncertainty. This, in turn, can ameliorate the negative effect of work burnout on exit intention. Therefore, based on the arguments above, this research hypothesizes:

Hypothesis4a: The relationship between job satisfaction and exit intention is stronger for social entrepreneurs without political connections.

Hypothesis4b: The relationship between work anxiety and exit intention is stronger for social entrepreneurs without political connections.

Hypothesis4c: The relationship between work burnout and exit intention is stronger for social entrepreneurs without political connections.

Figure 1 shows theoretical model.

METHOD

Sample and Procedure

Data for this research were collected in China, which is a typical context with the issues for social entrepreneurship raised above. We contacted the All-China Federation of Industry and Commerce for the data collection. This organization is a quasi-government organization of private firms that consists of business owners from firms of different sizes in various industries across China. It operates at the national, provincial, municipal and county level. The data were collected via an online questionnaire with Wenjuanxing (a survey tool), responded by the entrepreneurs who participated in the two large-scale colloquiums (onsite) organized by this organization in July (Jinan) and August (Qingdao) in 2021.

Since the questionnaire adopted by prior studies was initially developed in English, this research adopted the approach suggested by Brislin (119) for the translation. After the questionnaire draft was completed, a pilot test was performed (n = 50) to check whether it was necessary to make any adjustments. Finally, with a complementary literature review and field interviews, 22 items for seven constructs were eventually adopted. The Cronbach's alpha value of the pilot test was over 0.7, indicating that the internal consistency and stability of the questionnaire were acceptable (120).

We obtained 196 responses out of 450 invitations; the response rate is 43.6%. The questionnaire consisted of a general filter question and 7-point Likert items. According to the Global Entrepreneurship Monitor (GEM), the general filter was deployed to identify social entrepreneurs for this study:

"Are you, alone or with others, currently trying to start or currently owning and managing any kind of activity, organization or initiative that has a particularly social, environmental or community objective? This might include providing services or training to socially deprived or disabled persons, using profits for socially-oriented purposes, organizing self-help groups for community action, etc."

Entrepreneurs marking "no" were identified as ordinary/commercial entrepreneurs and excluded from this research; while the entrepreneurs choosing "yes" were regarded as social entrepreneurs for this research (121). This method has been widely adopted by other studies on social entrepreneurship (15, 122).

After screening for the invalid samples with significant missing or apparently problematic values, the sample size of this research remained to be 196. Among the respondents, 82.2% were more than 35 years old; 55.6% were women; 69.9% were married or living with a partner; and 52.6% of them had a bachelor's degree. **Table 1** shows an overview of the sample demographics.

Variables and Measurement
Dependent Variable
Exit Intention
This research measured entrepreneurs' exit intention using the three items developed by Pollack, Vanepps (123). The

TABLE 1 | Sample demographics.

Characteristics	Frequency	Percent (%)
Age		
18–25	9	4.6%
26–35	26	13.3%
36–45	106	54.1%
46–55	55	28.1%
Gender		
Male	87	44.4%
Female	109	55.6%
Marital status		
Married	137	69.9%
Non-married	59	30.1%
Length of current business ownership		
<3 years	56	28.6%
3–5 years	62	31.6%
6–10 years	36	18.4%
11–15 years	29	14.8%
>15 years	13	6.6%
Educational level		
Junior high school	0	0%
High school or equal	5	0.31%
Junior college	37	18.9%
Bachelor degree	103	52.6%
Postgraduate or above	51	26.0%

entrepreneurs responded to each of them with a 7-point Likert scale ranging from 1 (strongly disagree) to 7 (strongly agree).

Independent Variable

Prosocial Motivation

This research measured the prosocial motivation with the four items adopted by Grant (124), and a 7-point Likert scale ranging from 1 (strongly disagree) to 7 (strongly agree) for each of the items.

Mediating Variable

Job Satisfaction

Based on the elaboration of the advantages (125) following prior studies (126, 127), this research measured entrepreneurs' job satisfaction with a single item developed by Chordiya, Sabharwal (127): "Generally speaking, I am satisfied with my job", and a 7-point Liker scale ranging from 1 (strongly disagree) to 7 (strongly agree).

Work Anxiety

We measured work anxiety using the four-item general work anxiety scale developed by Haider, Fatima (128). Entrepreneurs responded to each of them with a 7-point Liker scale ranging from 1 (strongly disagree) to 7 (strongly agree).

Work Burnout

We adopted the ten-item general work burnout scale developed by Malach-Pines and Ayala (129). Entrepreneurs responded to each of them with a 7-point Likert scale ranging from 1 (strongly disagree) to 7 (strongly agree).

Moderating Variable

Political Connection

Following the representative studies (130, 131), affiliation with the state's political councils was employed by this study as an indicator of political connection. The survey asked whether the entrepreneur served as a representative in the National People's Congress (NPC) or Chinese People's Political Consultative Conference (CPPCC) at a national, provincial, municipal, or county level, since those two are the most important political institutions in which entrepreneurs have opportunities to develop political connection (132, 133). In this study, the respondents without political connection were coded as "1" and the respondents with political connection were coded as "2."

A summary of the operational definitions is shown in **Table 2**. And the English questionnaire has been appended, presenting details of all the measurements (see **Appendix A**).

Measurement of Control Variables

In accordance with most of the entrepreneurship studies, we included several demographic variables as the control variables (see **Table 1**) due to their potential impacts on sustaining social entrepreneurship (134, 135), such as age (136), educational achievement (coded as "1" = "Junior high school," "2" = "High school or equal," "3" = "Junior college," "4" = "Bachelor degree," and "5" = "Postgraduate or above"), gender (137) and time length of current business ownership.

Analytical Techniques

As an exploratory study, the partial least squares structural equation modeling (PLS-SEM) was adopted. This method is suitable for studying what has not been well tested before (138)—in this case, lack of knowledge or studies about the relationship between prosocial motivation and entrepreneurial exit intention. To decrease measurement error and avoid collinearity while examining the complicated relationship between prosocial motivation, job satisfaction, work burnout, work anxiety and exit intention, PLS becomes more suitable for this research than other SEM methods (139).

RESULTS

Deploying PLS-SEM, this research followed the two-step approach (140): the first step is to assess the outer model and the second step is to examine the inner model. **Table 3** presents the correlations and descriptive statistics for the constructs included in the research.

Outer Model and Scale Validation

The related tests for the outer model included the reliability of each item as well as the internal consistency, convergent validity, and discriminant validity of each construct. For the reliability of each item, the threshold value should be 0.5 for the individual reliability (141), and Fornell and Larcker (142) suggested the Cronbach's alpha value should be 0.7 for statistical significance. Besides, Fornell and Larcker (142) recommend a value 0.7 for the composite reliability, while Fornell and Larcker

Construct	Definition	Source
Exit intention	An entrepreneur's desire or goal, at some point in the future, to leave his or her venture.	Pollack et al. (123)
Prosocial motivation	The desire to benefit others or expend effort out of concern for others.	Grant (124)
Job satisfaction	An attitudinal evaluative judgment of one's job or job experiences.	Chordiya et al. (127)
Work anxiety	An emotional state of perceived apprehension and increased arousal.	Haider et al. (128)
Work burnout	The condition of physical and emotional exhaustion.	Malach-Pines and Ayala (129)

TABLE 3 | Descriptive statistics and correlations.

Variable	Mean	S.D.	PM	JS	WA	WB	EI
PM	4.91	0.78	NA				
JS	1.78	0.74	−0.33[**]	NA			
WA	4.98	1.04	0.52[**]	−0.11	NA		
WB	3.82	1.37	−0.09	0.43	0.12	NA	
EI	5.12	1.03	0.52[**]	−0.56[**]	0.41[**]	−0.04	NA

PM, prosocial motivation; JS, job satisfaction; WB, work burnout; WA,work anxiety; EI, exit intention.
[**]p < 0.01.

(142) recommend a value that is 0.5 for the AVE to evaluate the convergent validity of each composite. As **Table 4** shows, all the factor loadings are above 0.5, the Cronbach's alpha value is >0.7, the values for the composite reliability are above 0.7 (adequate internal consistency), and the AVE values are all above 0.5 (good convergent validity).

Discriminant validity can be analyzed by checking that the correlation between each pair of constructs is not greater than the value of the square root of the AVE for each construct and by using the heterotrait-monotrait ratio (HTMT). Normally, the HTMT threshold for acceptable discriminant validity is 0.90 (143): if the HTMT value is below 0.90, the discriminant validity is acceptable, which is as **Table 5** shows. Moreover, as **Table 6** shows, the comparison of cross loadings and factor loadings for each indicator signifies reasonable discriminant validity, since the factor loading of each scale item for its assigned latent construct is higher than its loading on any other constructs (141). Therefore, the constructs in this research have good discriminant validity.

Inner Model and Hypotheses Testing

Figure 2 and **Table 7** summarize the structural model from PLS analysis by showing the standardized path coefficients (β) and their significance (t-values) as well as the explained variance of endogenous variables (R^2). We calculated t-values through a bootstrap approach based on 5,000 random resamples.

Figure 2 and **Table 7** show that the prosocial motivation negatively and significantly affects job satisfaction, supporting hypothesis 1a (PM→ JS: β = −0.328, t-value = 5.382); prosocial motivation positively and significantly impacts work anxiety, supporting hypotheses 2a (PM→ WA: β = 0.535, t-value = 8.358); prosocial motivation has an insignificant impact on work burnout, rejecting hypotheses 3a (PM→ WB: β = −0.224, t-value = 1.248).

TABLE 4 | Reliability and AVE of the outer model.

Construct	Indicators	Cronbach's alpha	Factor loading	Composite reliability	AVE
PM	PM 1	0.847	0.869	0.897	0.686
	PM 2	–	0.845	–	–
	PM 3	–	0.763	–	–
	PM 4	–	0.831	–	–
WB	WB 1	0.968	0.625	0.953	0.677
	WB 2	–	0.581	–	–
	WB 3	–	0.677	–	–
	WB 4	–	0.766	–	–
	WB 5	–	0.911	–	–
	WB 6	–	0.946	–	–
	WB 7	–	0.840	–	–
	WB 8	–	0.944	–	–
	WB 9	–	0.946	–	–
	WB 10	–	0.885	–	–
WA	WA 1	0.925	0.885	0.945	0.812
	WA 2	–	0.932	–	–
	WA 3	–	0.904	–	–
	WA 4	–	0.887	–	–
EI	EI 1	0.931	0.910	0.956	0.880
	EI 2	–	0.962	–	–
	EI 3	–	0.941	–	–

PM, prosocial motivation; WB, work burnout; WA, work anxiety; EI, exit intention.
Job satisfaction is a single–item construct.

Besides examining R^2, we also tested the model's predictive validity by analyzing the predictive relevance of the exogenous variables Q^2 (144). With regard to Q^2, we find that the values of Q-square for job satisfaction ($Q^2 = 0.105$), work anxiety (Q^2

Factors	EI	JS	PM	WA	WB
EI					
JS	0.578				
PM	0.589	0.357			
WA	0.445	0.112	0.586		
WB	0.054	0.048	0.161	0.125	

PM, prosocial motivation; JS, job satisfaction; WB, work burnout; WA, work anxiety; EI, exit intention.

TABLE 6 | Standardized factor loadings and cross loadings of the outer model.

	EI	JS	PM	WA	WB
EI1	0.910	−0.571	0.469	0.335	−0.107
EI2	0.962	−0.532	0.498	0.422	−0.078
EI3	0.941	−0.466	0.503	0.479	−0.064
JS1	−0.558	1.000	−0.328	−0.113	0.055
PM1	0.440	−0.256	0.869	0.433	−0.312
PM2	0.376	−0.243	0.848	0.494	−0.080
PM3	0.455	−0.294	0.763	0.393	−0.090
PM4	0.461	−0.296	0.831	0.449	−0.240
WA1	0.255	−0.058	0.404	0.885	0.073
WA2	0.374	−0.130	0.469	0.932	0.003
WA3	0.312	−0.087	0.425	0.904	0.059
WA4	0.550	−0.116	0.575	0.884	0.039
WB1	−0.004	−0.015	0.012	0.082	0.624
WB10	−0.031	0.050	−0.130	0.129	0.885
WB2	0.009	0.062	0.102	0.163	0.581
WB3	0.049	0.019	0.067	0.207	0.677
WB4	0.001	0.011	−0.043	0.107	0.766
WB5	−0.067	−0.002	−0.151	0.032	0.911
WB6	−0.075	0.072	−0.116	0.086	0.946
WB7	−0.029	0.052	−0.103	0.121	0.840
WB8	−0.070	0.060	−0.182	0.078	0.944
WB9	−0.101	0.073	−0.246	0.019	0.948

PM, prosocial motivation; JS, job satisfaction; WB, work burnout; WA, work anxiety; EI exit intention. The gray cells are the factor loadings of scale items for each construct.

= 0.216), work burnout ($Q^2 = 0.001$), and exit intention ($Q^2 = 0.397$) are all larger than zero, suggesting that the theoretical model of this study has sufficient explanatory power.

Testing of Mediation Effects

This study has three mediating variables, namely job satisfaction, work anxiety, and work burnout. This research conducted the Sobel z test and found that the Sobel test z of the two mediating variables (job satisfaction and work anxiety) were both above 1.96, which means that both two mediating variables had an intermediary effect, whereas work burnout did not have an intermediary effect (see **Table 8**) (145).

Variance accounted for (VAF) refers to the proportion of indirect effects to total effects. In **Table 8**, The VAFs of the three mediating variables are 28.4, 27.3, and 1.1% respectively,

which means that the total indirect effect explains 28.4, 27.3, and 1.1% of the total effect respectively. According to Hair Jr, Hult (141), if VAF > 80%, it is full mediation; if VAF ≤ 80%, it is partial mediation; if VAF < 20%, there is no mediation. **Table 6** indicates that job satisfaction and work anxiety were significant partial mediators between prosocial motivation and exit intention, whereas work burnout was not a significant mediator. Hence, these results confirm hypotheses 1b and 2b while reject hypothesis 3b.

Multi-Group Analysis

In this research, given political connection is a categorical variable (1 = without political connection, and 2 = with political connection), multiple group analysis procedure (PLS-MGA) via SmartPLS (Version 3.3.3) for group comparisons became an appropriate approach for the analysis. PLS-MGA was conducted with a bootstrapped sample of 5,000 to examine the statistical significance of the two comparable groups' path coefficients (146). The path coefficients of different groups allow us to see which path is distinct, how different the paths are, and whether there is difference in path direction. The results are presented in **Table 9**.

The path coefficients (β) have been estimated, and the differences of the two coefficients have been analyzed. The results indicated that the path coefficient between prosocial motivation and job satisfaction for group A (without political connection) was significantly greater than that for group B (with political connection) (H4a: βdiff = 0.269, *p* = 0.008). Meanwhile, the path coefficient between prosocial motivation and work anxiety for group A (without political connection) was significantly larger than that for group B (with political connection) (H4b: βdiff = 0.252, *p* = 0.030). Therefore, H4a and H4b are supported.

Comparatively, the PLS-MGA results indicate that there was no statistically significant difference between the sub-sample of social entrepreneurs without political connection and the one with political connection in the path between prosocial motivation and work burnout. Accordingly, H4c is not supported.

DISCUSSION

Echoing the prior studies calling for in-depth investigation on the negative facets of social entrepreneurship (12, 147), this research unveiled how entrepreneurs' prosocial motivation can affect their exit intention in the context of a transitional economy through the mediation of work-related wellbeing. In addition to the theoretical implications, the findings have significant implications for the social entrepreneurs, especially those running social businesses in a transitional economy (12–14). By doing so, we shift the focus of prior research (3, 18) from the "bright side" to the "dark side" of its (prosocial motivation's) potential effect on entrepreneurs (45).

Theoretical Implication

This study found support for the negative relationship between prosocial motivation and job satisfaction (H1a). This is not

FIGURE 2 | Path coefficient and R-squares of their inner model.
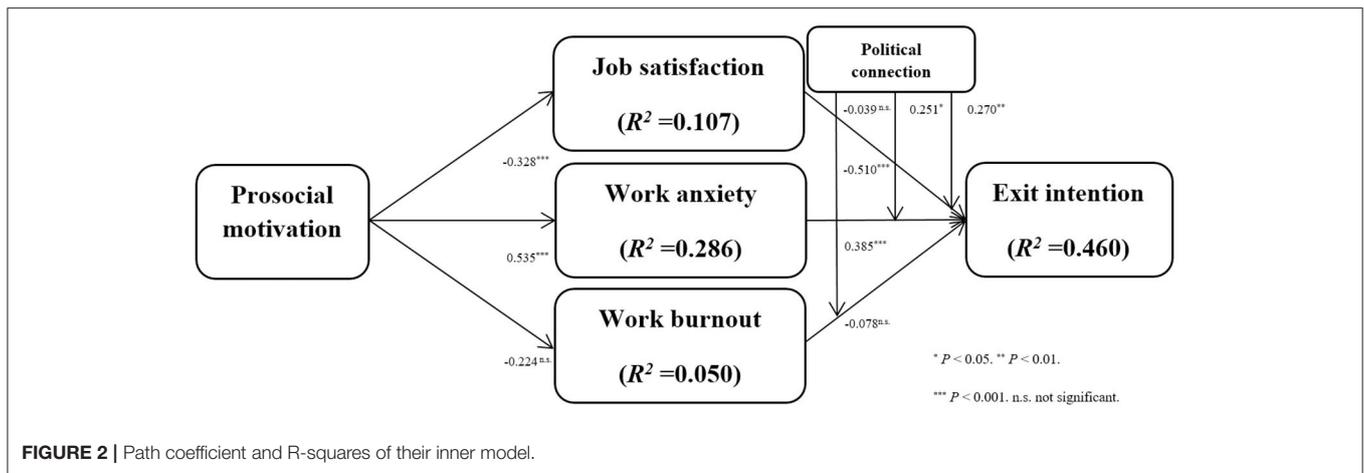
in line with the result reported by Brieger et al. (58) who found that entrepreneurs' prosocial characteristics positively impact job satisfaction in Germany. This difference is related to the developmental stage of an economy, and entrepreneurial activities are unquestionably embedded in the pertinent social and cultural norms and values (55). Compared to a developed economy like Germany, in a transitional economy, materialistic values and beliefs, instead of pursuing a balance between economic and social performance, are prioritized (58). Thus, social value creation embedded in entrepreneurial activities can hardly gain the respect of family members, friends and the broader community in a transitional economy, negatively affecting the social entrepreneurs' job satisfaction. Besides, previous research based on World Values Survey (WVS) (148) claimed a considerable variation in social entrepreneurial prevalence among different societal cultures. In a traditional or survival society, human beings' physical and economic security is regarded to have more priority over other issues, implying negative attitudes toward social entrepreneurial activities. Therefore, this research somewhat responds to prior studies calling for examining how different contextual conditions of diverse economies affect social entrepreneurial activities.

In addition, we found that prosocial motivation is positively related to work anxiety (H2a), which is unique since no prior studies have specifically investigated such a nexus between prosocial motivation and work anxiety. While Azmat, Ferdous (83) and Mair and Marti (84) suggested that social ventures often face tensions owing to scarcity of resources especially financial ones, our findings imply that entrepreneurs with strong prosocial motivation can be regarded as non-profit-driven in a transitional economy, leading to more difficulty of financing their enterprises and thus their work anxiety. Hence, this study somewhat extends the work of Azmat, Ferdous (83) and Mair and Marti (84).

Moreover, we found that prosocial motivation is indirectly related to exit intention via job satisfaction (H1b) and work anxiety (H2b) in a transitional economy. On the one hand, this finding echoes prior studies demonstrating how (dis)satisfaction with specific life domains (work, family) is linked to exit intentions (149–151). On the other hand, this corresponds to the call for studying potential mediating variables to enhance

TABLE 7 | Summary of inner model results.

Hypotheses	Path coefficients (β)	t–value	Supported
H1a: PM–>JS	−0.328***	5.382	Yes
H2a: PM–>WA	0.535***	8.358	Yes
H3a: PM–>WB	−0.224[n.s.]	1.248	No

PM, prosocial motivation; JS, job satisfaction; WB, work burnout; WA, work anxiety.
***P-value < 0.001; n.s. not significant.
Number of bootstrap samples = 5,000.

TABLE 8 | Test of mediation effect.

	Original Sample (O)	Standard Error (STERR)	T Statistics (|O/STERR|)	
PM –> JS	−0.329	0.090	3.647	
JS –> EI	−0.452	0.073	6.188	
PM –> WA	0.534	0.089	5.998	
WA –> EI	0.268	0.125	2.151	
PM –> WB	−0.223	0.213	1.050	
WB –> EI	−0.025	0.082	0.305	
PM –> EI	0.227	0.109	2.072	
	PM–>JS–>EI	**PM–>WA–>EI**	**PM–>WB–>EI**	**Total indirect effect**
Indirect effect	0.149	0.143	0.006	0.524
Sobel Z Test	3.14	2.02	0.29	–
VAF	0.284	0.273	0.011	0.567

PM, prosocial motivation; JS, job satisfaction; WB, work burnout; WA, work anxiety; EI, exit intention.
Number of bootstrap samples = 5,000.

understanding of the connections between prosocial motivation and entrepreneurial exit intention (22, 152), advancing our relevant understanding (12, 58, 105).

Furthermore, we found that the relationship between job satisfaction and exit intention as well as work anxiety and exit intention is stronger for the social entrepreneurs without political connections, respectively (H4a and H4b). This

Path	Pooled		Group A (Without PC)		Group B (With PC)		Grp A VS	Supported
	N = 196		N = 121		N = 75		Grp B	
	β	CI	β	CI	β	CI	P–value	
JS–>EI	−0.510	(−0.608, −0.403)	−0.651	(−0.527,−0.229)	−0.382	(−0.760,−0.535)	0.008	YES
WA–>EI	0.385	(0.275, 0.507)	0.486	(0.352, 0.618)	0.234	(0.289,0.385)	0.030	YES
WB–>EI	−0.078	(−0.183, 0.099)	−0.066	(−0.252, 0.047)	−0.105	(−0.378,-0.197)	0.846	NO

PM, prosocial motivation; JS, job satisfaction; WB, work burnout; WA, work anxiety; EI, exit intention; PC, political connection.
β, path coefficient; CI = 95% Confidence interval.

implies that in spite of the negative work-related wellbeing of social entrepreneurs in a transitional economy caused by the unfavorable socioeconomic environment (13), connections with political authorities can provide buffers against its negative effect on their exit intention. For instance, the political connections can provide more information regarding potential societal issues and thus necessity of social works (27, 89), mitigating the negative effect of weakened job satisfaction on exit intention. Likewise, the political connections can help transfer the information about how an exemplary social entrepreneur in such a context managed to sustain his or her social venture (27, 130, 153), ameliorating the negative effect of attenuated work anxiety on exit intention. Hence, those findings are remarkable since it further implies the necessity of studies in the context of a transitional economy and the significance of "human condition," which prevalent social entrepreneurship theories do not adequately include (12). As social entrepreneurs cannot be utterly reactive in the context of a transitional economy with more turbulent dynamics (14, 27), there can be more additional alternatives like political connections adopted by the social entrepreneurs, diminishing the exit intention. Furthermore, there could be a more complex mechanism leading to the exit intention. For instance, political connections might incur the reciprocity irrelevant to the growth of social entrepreneurship (99, 118), which in turn may further attenuate the weakened job satisfaction or work anxiety, somewhat undermining the buffering effect of political connections on the negative relationship between job satisfaction or work anxiety and exit intention. Therefore, those findings are remarkable also in terms of the implication for further studies, narrowing an essential gap in extant social entrepreneurship literature: comprehensive mechanisms that map how individual-level political connections aggregate into the entrepreneurial decision of social entrepreneurs (12, 147).

However, contrary to our prediction, we did not find support for prosocial motivation's effects on entrepreneurial work burnout (H3a), work burnout's mediating role in the relation between prosocial motivation and exit intention (H3b), and political connection's moderating effect on the nexus between work burnout and exit intention (H4c). The inconsistency between our prediction and the empirical results is probably due to the sampled entrepreneurs' age, gender, and marital status. First, over 70% of the respondents were below 45 years old in this research. Prior literature pointed out a non-linear trend of entrepreneurial enthusiasm: it escalates with age increase, peaking around the age of 35–44 (154). Accordingly, young,

especially nascent entrepreneurs are more enthusiastic about starting an autonomous career and managing a business. Second, gender role theory claimed that most occupations remain gender-typed (155), and men in female-typed occupations reported more significant psychological distress and poorer self-evaluated health, and vice versa. Previous research claimed that social entrepreneurs are female-typed occupations (156, 157), while over 55% of the respondents were female in this research. Third, nearly 70% of the respondents were married in this research, and the spouse or partner can provide significant help to cope with the work burnout (158, 159). Therefore, the entrepreneurs' work burnout in this research might be less perceptible and underestimated.

Practical Implication

According to this study, social entrepreneurs in a transitional economy tend to have a lower level of work-related wellbeing, escalating their exit intention that undermines their business sustainability and career development. Based on the findings, first, social entrepreneurs need to be fully aware of the role of work-related wellbeing in such a context, which may otherwise expedite entrepreneurial failure eventually. Second, given the critical role of work-related wellbeing in shaping the social entrepreneurs' exit intention, entrepreneurship educators may need to provide more knowledge and tools to enhance and maintain the social entrepreneurs' work-related wellbeing. Only focusing on the successful case studies for the training programs on entrepreneurship can be problematic and misleading. Third, relevant governmental agencies should provide more support such as relevant policies, facilities, training, and consultation to improve social entrepreneurs' work-related wellbeing. Fourth, establishing political connections according to relevant laws, regulations and policies with the governmental agencies or agents who support or need to support social businesses can be an alternative for social entrepreneurs surviving in the context of a transitional economy.

Limitations and Future Research Directions

Before concluding, the limitations of this research should be noted. First, as the data of this study were collected in China which has a distinctive institutional and cultural environment, future research that replicates our findings in other distinctive institutional and cultural environments may strengthen the generalizability of our conclusions. Second, a sample without the imbalanced ratio of gender, marital status and educational level can be employed in future studies to test our findings

and the potential moderating effects of gender, marital status and educational level can also be examined. Third, this research did not measure the respondents' actual exit. Although research on intentions indicates a high probability of pertinent action (particularly when individuals have perceived control over their actions), and 70% of those who had exit intention take the substantial step eventually (160), it is certainly plausible that the actual exit differ from the exit intention, and further studies could employ behavioral measurements to corroborate our findings. Finally, although this study supplements the yet rare quantitative studies in social entrepreneurship research (161), the detailed mechanism and the interplay between the variables are still unknown, which in turn may need qualitative approaches for more in-depth exploration.

DATA AVAILABILITY STATEMENT

The original contributions presented in the study are included in the article/supplementary materials, further inquiries can be directed to the corresponding author/s.

ETHICS STATEMENT

Ethical review and approval was not required for the study on human participants in accordance with the local legislation and institutional requirements. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

Conceptualization: JD, XW, XC, and DH. Methodology, software, validation, formal analysis, investigation, resources, data curation, writing—original draft preparation, and visualization: JD. Writing—review and editing, supervision, and funding acquisition: XW. All authors contributed to the article and approved the submitted version.

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APPENDIX

Appendix A | The questionnaire.

Construct	Items
Prosocial motivation (PM)	(1) I care about benefiting others through my work. (2) I want to have positive impact on others. (3) Because I want to have positive impact on others. (4) It is important to me to do good for others through my work.
Job satisfaction (JS)	(1) Generally speaking, I am satisfied with my job.
Work anxiety (WA)	(1) I have felt fidgety or nervous as a result of my job. (2) My job gets to me more than it should. (3) There are lots of times when my job drives me right up the wall. (4) Sometimes when I think about my job, I get a tight feeling in my chest.
Work burnout (WB)	When you think about your work overall, how often do you feel the following? (1) Tired (2) Disappointed with people (3) Hopeless (4) Trapped (5) Helpless (6) Depressed (7) Physically weak/Sickly (8) Worthless/Like a failure (9) Difficulties sleeping (10) "I've had it"
Exit intention (EI)	Participants rated the extent to which they would, in the next year? (1) Avoid entrepreneurial positions (2) Feel anxious about entrepreneurial positions (3) Feel less excited about entrepreneurial positions

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