



Working time variation and mental health during the Covid-19 pandemic in China

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ABSTRACT

The Covid-19 pandemic has brought about a significant shift in labor market dynamics, leading to a notable increase in labor market flexibilization. One prominent aspect of this transformation is the growing variation in working time patterns. The irregular and unpredictable nature of working time may contribute to increased stress levels, difficulty in establishing routines, and challenges in maintaining work-life boundaries. Drawing on China General Social survey 2021, this study aims to examine (1) the relationship between working time variation and mental health during the Covid-19 pandemic in China; (2) whether the relationship can be mediated by work-family conflict; (3) to what extent the relationship varies across occupations. We find that working time variation is associated with significantly worse mental health during the Covid-19 pandemic in China, and around half of the negative effect can be mediated by increased work-family conflict. Moreover, the negative association is more pronounced among non-professional occupations than professional occupations. Overall, these findings shed light on the detrimental impact of working time variation on mental health and its potential mechanism, highlighting how novel work paradigm may interact with existing labor market inequalities to shape workers' mental health.

1. Introduction

The Covid-19 pandemic has not only disrupted economies and industries worldwide but has also ushered in a transformative change in labor market dynamics. The rise of gig economy and increased emphasis on remote work and flexible work arrangements has accelerated the trend of labor market flexibilization (Kalleberg, 2011; Wang et al., 2022; Wang et al., 2022; Wood, Graham, Lehdonvirta, & Hjorth, 2019). This shift has been marked by a noticeable increase in the variation of working time patterns. Traditional notions of the standard 9-to-5 workday have been challenged as employees have adapted to hybrid work models, flexible schedules, and remote work options. As organizations strive to maintain operational continuity and adapt to changing circumstances, the lines between work and personal life have become increasingly blurred (Chung, Birkett, Forbes, & Seo, 2021). This growing variation in working time patterns reflects a fundamental reevaluation of how work is structured and performed, with significant implications for employees' mental health and wellbeing (Schneider & Harknett, 2019).

Working time variation has been identified as a significant factor contributing to poor mental health outcomes for a number of reasons. First, the irregular and unpredictable nature of working time patterns often involves limited control over one's schedule and the ability to make decisions regarding when and how work is performed. The lack of personal autonomy and control can lead to feelings of powerlessness and frustration, as individuals may experience a diminished sense of agency over their work and personal lives (Schneider & Harknett, 2019; Wang et al., 2022). This lack of control can contribute to increased stress levels and a reduced ability to cope with work-related and personal stressors, leading to poorer mental health outcomes. The lack of working time control, in turn, leads to increased stress levels and difficulties in maintaining a healthy work-life balance (Kurowska, 2020). The constant need to adapt to changing schedules and work demands can result in heightened levels of psychological strain. Second, the blurring of boundaries between work and family lives due to working time variation may result in individuals experiencing difficulty in disengaging from work-related responsibilities (Chung & van der Lippe, 2020; Kalliath & Brough, 2008). The blurring of boundaries between work and family

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domains can create conflicts between work-related demands and familial responsibilities. The increased flexibility in working time may result in individuals experiencing difficulties in establishing clear boundaries between work and family roles, leading to role overload and conflict (Clark, 2000). The constant juggling of work-related tasks and family responsibilities can heighten stress levels, strain interpersonal relationships, and impede individuals' ability to effectively fulfill their multiple roles (Greenhaus & Beutell, 1985). Given the above discussions, we formulate the following hypotheses.

Hypothesis 1. There is a significant association between working time variation and poor mental health.

Hypothesis 2. The association between working time variation and poor mental health can be significantly mediated by work-family conflicts.

Socioeconomic disparities play a crucial role in understanding the differential impact of working time variation on mental health across occupational classes (Nawakitphaitoon & Tang, 2020; Wu, 2019). Low occupational class individuals often face precarious employment conditions, limited job security, and lack of control over their working hours. The increased working time variation in these lower-class occupations, such as shift work, irregular schedules, and long hours, exacerbates the strain on individuals' mental well-being (Zhou, 2012). In contrast, individuals in high occupational class positions tend to have more autonomy and control over their working hours, allowing them to better adapt and manage the demands of their work and personal lives, thereby reducing the negative impact on their mental health (Muñoz de Bustillo, Fernandez-Macias, Anton, & Esteve, 2011). Another contributing factor to the pronounced association between working time variation and poor mental health in low occupational class individuals is the limited access to resources and support systems. Low occupational class individuals often face financial constraints, limited access to healthcare, and lack of social support networks (Green, 2006). In contrast, high occupational class individuals may have greater access to resources, including financial stability, healthcare services, and stronger social support networks. These resources act as buffers that mitigate the negative impact of working time variation on mental health outcomes, making the association less pronounced in high occupational class settings (Chandola & Zhang, 2018). Furthermore, the nature of work in low occupational class positions may involve physically demanding, monotonous, and less fulfilling tasks compared to high occupational class positions that involve more complex, intellectually stimulating work. The combination of the above factors helps us formulate the following hypothesis.

Hypothesis 3. The association between working time variation and poor mental health is more pronounced in low occupational class than high occupational class.

2. The Chinese context

China provides a unique and valuable setting to study the association between working time variation and mental health due to several reasons. First, China has undergone rapid economic growth and significant changes in its labor market over the past few decades. The shift from traditional work structures to more flexible forms of employment has resulted in a wide range of working time variations, including irregular shifts, long working hours, and non-standard schedules (Nawakitphaitoon & Tang, 2020). Examining the association between working time variation and mental health in China allows researchers to investigate the impact of these recent changes in work arrangements on employee well-being. Second, China has one of the largest workforces globally, representing diverse industries and occupational categories. This diversity provides an opportunity to examine the association between working time variation and mental health across different sectors and occupations (Zhou, 2012). By including a wide range of job types, such

as manufacturing, services, and professional sectors, researchers can capture variations in working conditions, job demands, and exposure to working time variation, enhancing the generalizability of the findings and allowing for a comprehensive understanding of the relationship. Third, China's unique cultural and social context adds depth to the study of the association between working time variation and mental health (Nawakitphaitoon & Tang, 2020; Wu, 2019). Traditional cultural values, such as strong work ethic and family-oriented priorities, may influence individuals' perceptions of working time variation and its impact on their mental well-being. Exploring how cultural factors interact with the effects of working time variation provides insights into the cultural nuances and social dynamics that shape the relationship between work and mental health in the Chinese context.

3. Method

3.1. Study design

This study adopted a cross-sectional design based on a nationally representative survey: the China General Social Survey (CGSS) 2021. The CGSS is one of the largest nationally representative surveys in China and provides up-to-date information on the patterns of demographic, socioeconomic and health changes over time (for more information, see <http://cgss.ruc.edu.cn/English/Home.htm>).

3.2. Setting

The CGSS survey was conducted in China during 2021. China is appropriate research setting due to its overwork norm and rapid changes in employment relations. For more details, see Section 2. The Chinese Context.

3.3. Participants

The CGSS utilized a rigorous multistage stratified probability-proportional-to-size random sampling method to acquire a nationally representative sample in China. The data collection process involved face-to-face interviews and self-completion questionnaires, which were administered by experienced researchers. Prior to conducting the study, ethical approval was obtained from the Renmin University of China.

3.4. Variables and measures

The dependent variable for this study is workers' mental health. It is measured by the 12-Item Short Form (SF-12) Health Survey mental health component, which is a widely used and validated measure of mental health across the world. The independent variable for this study is working time variation. It is measured by the following questions: "In the past month, the week you worked the most hours, how many hours did you work?" and "In the past month, the week you worked the shortest hours, how many hours did you work?". Thus, the variable is constructed as the difference between the longest and shortest working hours in the past month. The mediator of this study includes work-family conflict, which is measured by following the questions: "In general, do you feel that your work interferes with your family life?" and "Overall, do you feel that your family life gets in the way of your work" on a scale from 1 (never) to 5 (always). Given the high internal consistency (Cronbach's alpha = 0.7), the average score is calculated. In addition, given that previous research has shown the associations of a wide range of socio-demographic characteristics with working time and mental health (Chowdhury et al., 2021; Chowdhury, Kabir, Akter, et al., 2023; Schneider & Harknett, 2019; Wang et al., 2022), we control for the following demographic and socioeconomic characteristics. These covariates include gender, age, age squared, ethnicity, hukou type, education level, partnership, presence of children, region type, work sector, political party membership, working hours per week. Table 1 shows the

Table 1
Weighted descriptive statistics.

Working time variation, M (SD)	12.68 (15.34)	N = 476
SF-12 mental health score, M (SD)	46.32 (10.49)	N = 476
Work-Family Conflict (1–5), M (SD)	1.81 (0.03)	N = 476
Age	39.51 (0.32)	N = 476
Gender, %		
Male	56.90%	N = 271
Female	43.10%	N = 205
Hukou Type, %		
Non-Rural	50.07%	N = 241
Rural	49.93%	N = 235
Education, %		
Secondary and below	64.50%	N = 307
Tertiary and above	35.50%	N = 169
Partnership, %		
No partner	25.49%	N = 121
Have a partner	74.51%	N = 355
Ethnicity, %		
Han	95.46%	N = 454
Ethnic minorities	4.54%	N = 22
Parenthood, %		
No	46.91%	N = 223
Yes	53.09%	N = 253
Region Type, %		
Western	15.39%	N = 73
North East	7.04%	N = 34
Central	27.66%	N = 132
East	49.91%	N = 237
Political party membership, %		
No	86.98%	N = 413
Yes	13.02%	N = 63
Work sector type, %		
Private	74.69%	N = 360
Public	24.31%	N = 116
Occupation, %		
High	27.07%	N = 129
Intermediate	51.74%	N = 246
Low	21.19%	N = 101
Hourly Wage, M (SD)	34.20 (5.18)	N = 476

Note. Percentages (%) are shown for categorical variables and means (M) and standard deviations (SD) are shown for continuous variables.

weighted descriptive analyses of all variables.

3.5. Bias

There may be bias from unequal non-response rates as a result of multistage cluster sampling design. Thus, we have weighted all the analyses to correct selection probabilities and non-response rates. The survey weight in CGSS is a probability weight, which was calculated as the inverse of the probability that each person was selected from the primary and secondary sampling units (for more details, see <http://www.chinagss.org>).

3.6. Study size

To construct the sample for analysis, we restricted the sample to those who were employed.

Next, we restrict the sample to the respondents who answered the questions of mental health. Finally, after deleting a very small number of missing cases, the final analysis sample consists of 476 cases.

3.7. Statistical method

In terms of the statistical method, we used multiple linear regression models to examine the association between working time variation and mental health. Linear regression model is used because the dependent variable is treated as a continuous variable and because the assumptions for linear regression model are satisfied (see below). Multiple rather than simple linear regression model was used because it is important to control for a wide range of respondents' demographic and

socioeconomic characteristics, which have been shown to relate to working time variation and mental health (Inanc, 2018; Schneider & Harknett, 2019). The multiple linear regression model was estimated by the Ordinary Least Squares (OLS) method, which has been widely used in previous research (Li & Wang, 2022; Moen et al., 2016). To better illustrate the results, we first report the main effects of working time variation on mental health. Next, we conduct mediation analyses to examine the role of work-family conflict in mediating the effect of working time variation. Finally, we conduct interaction analyses to examine whether the effect of working time variation varies across occupations.

In addition, we have conducted a number of tests to check whether the assumptions for OLS regression are satisfied. First, regarding the normality assumption, the Shapiro Wilk W. Normality Test shows that the residuals are normally distributed ($p = 0.515$). Second, regarding the multicollinearity assumption, the VIF (Variance Inflation Factor) for all variables is below 3, suggesting that there is no strong multicollinearity between explanatory variables. Third, regarding the linearity assumption, we have used various approaches such as augmented component-plus-residual plot and found that the associations between continuous variables are generally linear. For variables that may have non-linear effects, we have conducted relevant statistical transformations (e.g., age squared, logged income) in order to take into account their non-linear effects. Fourth, regarding the homoscedasticity assumption, the Breusch-Pagan test shows that the variance of the residuals is homogenous ($p = 0.362$). Fifth, regarding the independence assumption, we have used clustered standard errors to consider the potential cluster effects during the sampling process. Overall, these tests suggest that our model is robust and can satisfy various assumptions.

4. Results

4.1. Descriptive statistics

Table 1 reports descriptive statistics of key analytic variables. In the sample, the average working time variation is 12.68 h per week. Regarding the demographic characteristics, the average age of the respondents is 39.51 and around 57% of the respondents are men. In addition, around 75% are married or cohabiting, around 53% have children, and the majority (around 95%) is from the Han ethnic group. Regarding the socioeconomic status, around 35% have the tertiary education level or above, around 50% are registered as rural households, around 27% have high (managerial and professional) occupational status, around 24% work in public sectors, and around 13% are affiliated with a political party.

4.2. Multiple linear regression models

Table 2 reports the results of multiple regression models. Model 1 shows that after controlling for a wide range of demographic and socioeconomic characteristics, working time variation is significantly and negatively associated with mental health ($\beta = -0.08$, $p < 0.05$), lending support to the hypothesis 1. Specifically, with 1 h increase in working time difference, the mental health score will decrease by 0.08. Regarding the control variables, those who are members of political parties and those with higher hourly wages tend to have significantly better mental health than their counterparts. In addition, Model 2 shows that after including work-family conflict in the model, the association between working time variation and mental health becomes much smaller in size ($\beta = -0.03$) and no longer significant. In contrast, work-family conflict is significantly and negatively associated with mental health ($\beta = -4.36$, $p < 0.001$). Further bootstrapping mediation analyses show that higher work-family conflict can significantly mediate the association between working time variation and mental health (indirect effect = -0.05 , $p < 0.001$), and percent of mediation effect in the total effect is around 53%. This result supports the hypothesis 2.

Table 2
Ordinary Least Squares (OLS) regression models predicting effect of working time variation on 12-item Short Form mental health score.

	Model 1	Model 2
Working time variation	-0.08* (0.04)	-0.03 (0.04)
Work-family conflict		-4.36*** (0.61)
Gender (Ref. = Male)		
Female	-1.64 (1.04)	-1.95 (1.00)
Age	0.06 (0.08)	0.03 (0.07)
Age squared	-0.00 (0.00)	-0.00 (0.00)
Hukou Type (Ref. = Non-rural)		
Rural	1.88 (1.12)	1.54 (1.01)
Education (Ref. = Non-tertiary)		
Tertiary and above	-0.93 (1.24)	-0.59 (1.16)
Partnership (Ref. = No Partner)		
Have a partner	0.70 (1.53)	1.46 (1.42)
Ethnicity (Ref. = Han)		
Ethnic minorities	-0.13 (2.86)	-1.27 (2.52)
Parenthood (Ref. = No)		
Yes	-1.39 (1.23)	-1.96 (1.18)
Region Type (Ref. = Western)		
North East	1.85 (2.44)	-1.08 (2.52)
Central	0.97 (1.62)	-0.53 (1.58)
East	1.15 (1.48)	0.66 (1.43)
Political party membership (Ref. = No)		
Yes	5.15*** (1.32)	4.75*** (1.32)
Work sector type (Ref. = Private)		
Public	1.29 (1.21)	1.80 (1.18)
Occupation (Ref. = High)		
Intermediate	-0.16 (1.11)	-0.38 (1.06)
Low	-1.49 (1.76)	-0.65 (1.66)
Working hours per week	-0.05 (0.04)	-0.01 (0.04)
Logged hourly wage	0.58** (0.21)	0.52** (0.17)
Constant	48.44*** (5.62)	55.23*** (5.31)
Observations	476	476
F-values	6.39	6.81
R ²	0.10	0.20

Note. Standard errors in parentheses. + p < 0.1, *p < 0.05, **p < 0.01, ***p < 0.001.

Table 3 reports the interaction effect between working time variation and occupation on mental health. The main effect of working time variation shows that for those in high-grade (professional and managerial) occupations the association between working time variation and mental health is negative ($\beta = -0.06$) but not statistically significant. The interaction effect shows that compared with those from high occupations, the negative effect of working time variation is comparable for those from intermediate occupations, but significantly larger for those from low occupations ($\beta = -0.27$, $p < 0.05$). This result supports the hypothesis 3, highlighting the vulnerability of workers from low occupations to the negative effect of working time variation.

Table 3
Ordinary Least Squares (OLS) regression models predicting the interaction effect between working time variation and occupational class on 12-item Short Form mental health score.

	Model 1
Working time variation	-0.06 (0.07)
Occupation (Ref. = High)	
Intermediate	1.11 (1.62)
Low	-0.53 (2.56)
Working time variation * Occupation	
Working time variation * Intermediate	-0.02 (0.09)
Working time variation * Low	-0.27* (0.11)
Constant	52.11*** (6.02)
Observations	476
F-values	6.91
R ²	0.21

Note. Standard errors in parentheses. + p < 0.1, *p < 0.05, **p < 0.01, ***p < 0.001. The model controls for age, age squared, hukou type, education, partnership, ethnicity, parenthood, region, political party membership, work sector type, working hours per week, logged hourly wage.

5. Discussion

The findings of this study contribute to the existing literature on the relationship between working time variation and mental health during the Covid-19 pandemic in China, while also examining the mediating role of work-family conflict and exploring variations across different occupational categories. By drawing on the China General Social Survey 2021, this study provides valuable insights into the unique context of China and extends our understanding of the implications of non-standard employment on employee well-being.

Firstly, the study confirms a significant association between working time variation and worse mental health outcomes during the Covid-19 pandemic in China. These findings align with previous research that has highlighted the potential negative impact of irregular and unpredictable working patterns on mental well-being (Inanc, 2018; Schneider & Harknett, 2019; Voßmer et al., 2018). This study is among the first to examine the relationship between irregular and unpredictable working time patterns and mental health in China. The results echo similar research conducted in the United States and Europe (Schneider & Harknett, 2019; Wang et al., 2022). By specifically examining the context of the pandemic, this study underscores the importance of considering the role of working time variation as a contributing factor to the mental health challenges faced by individuals during times of crisis and uncertainty.

Secondly, the study identifies work-family conflict as a significant mediating mechanism through which working time variation affects mental health. The results demonstrate that increased work-family conflict partially mediates the relationship between working time variation and poor mental health outcomes (Chung & van der Lippe, 2020; Kelly et al., 2014; Li & Wang, 2022; Wang & Li, 2022). This finding highlights the importance of understanding the interplay between work-related demands and familial responsibilities, particularly in the context of flexible work arrangements (Wang & Lu, 2022). By elucidating the mediating role of work-family conflict, the study emphasizes the need for organizations and policymakers to consider strategies that promote work-life balance and reduce conflicts between work and family domains to safeguard employee mental well-being (Moen et al., 2016).

Furthermore, the study reveals variations in the association between working time variation and mental health across occupational categories. Specifically, the negative association is found to be more

pronounced among non-professional occupations compared to professional occupations. This finding highlights the differential vulnerability of individuals in different job sectors to the adverse effects of working time variation on mental health (Nawakitphaitoon & Tang, 2020; Wu, 2019). It underscores the need for targeted interventions and support systems tailored to the specific challenges faced by non-professional workers, such as those in manual labor or service industries, to mitigate the negative impact on their mental well-being.

6. Limitations and future research directions

There are a number of limitations, which could be directions for future research. First, although this article is the first study to examine the association between working time variation and mental health, the use of cross-sectional data prevents us from making causal claims. Future research using longitudinal data or instrumental variable approach could better understand the dynamic role of working time variation in shaping mental health. Second, due to limited space, this study only focuses on mental health of workers. Future research could pay more attention to other health outcomes such as physical health and health behavior in order to gain a more comprehensive understanding of role of working time variation in workers' health status. Third, the results in this study are only applicable to China and may not be able to be generalized to other contexts. Future research using data from other countries or cross-national data could provide more insights into how macro-level institutional factors moderate the role of working time variation in mental health (Chowdhury et al., 2021; Chowdhury, Kabir, Akter, et al., 2023; Chowdhury, Kabir, Chowdhury, & Hossain, 2022; Chowdhury, Kabir, Das, et al., 2023; Chowdhury, Kabir, Mazumder, et al., 2022; Kabir et al., 2022).

7. Conclusions

In conclusion, this study makes significant contributions to the literature by providing empirical evidence on the relationship between working time variation and mental health during the Covid-19 pandemic in China. The findings highlight the detrimental effects of working time variation on mental well-being and underscore the mediating role of work-family conflict and holds significant policy implications. Moreover, the study identifies variations across occupational categories, emphasizing the importance of considering occupational context when examining the impact of working time variation on mental health outcomes. These insights contribute to a deeper understanding of the consequences of non-standard employment and provide valuable guidance for organizations, policymakers, and practitioners in promoting employee well-being and developing strategies to mitigate the negative effects of working time variation on mental health in the evolving world of work (Shi & Wang, 2021; Wang & Morav, 2021). Overall, this study emphasizes the need for policies and initiatives that promote work-life balance, enhance mental health support for workers, and address labor market inequalities. By taking these measures, policymakers can mitigate the detrimental effects of working time variation on workers' mental health, especially during the Covid-19 pandemic, and contribute to a healthier and more resilient workforce.

Author statement

W.P. designed the research project, analyzed the data and conducted the literature review. F.F.J. designed the research project, wrote and revised the article. Y.L. designed the research project, wrote and revised the article.

Ethical statement

The ethical approval of the data collection was obtained from the Renmin University of China.

Declaration of competing interest

None.

Data availability

Data will be made available on request.

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