



Mental and Physical Health for Construction-related Employees: Effects of Work from Home (WFH) and Demographic Indicators

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The rapid and broad shift to Work from Home (WFH) caused by the COVID-19 creates great changes for construction-related employees, which may impact their mental and physical health and further influence organizational management. Demographic indicators are also critical factors influencing mental and physical health. However, the impacts of WFH on mental health were unclear. Also, limited studies explored specific health-related symptoms and demographic differences for construction-related employees considering WFH. This study aims to explore the mental and physical health of construction-related employees considering WFH and demographic indicators using an online survey in the U.S. Based on responses from 73 construction-related employees, two-way Analysis of Variance (ANOVA) results showed that age had a significant impact on depression, pain in the neck, shoulders, or back, and eyestrain symptoms, while WFH, gender, and marital status were not significant factors. Employees between 40 – 59 years old had worse mental and physical health, while participants older than 60 years old reported the best mental and physical health. The potential reason is the differences in pressures, abilities, and past experiences among age groups. The findings contribute to the theoretical understanding of construction-related employees' health and its related factors. The study also helps construction-related employees to improve mental and physical health under the WFH arrangements considering demographic differences and prepare them for future challenges.

Key Words: Mental health, Physical health, Work from home, Construction-related employees, Demographic indicators.

Introduction

Since the breakout of COVID-19, most people have had to work from home (WFH) because of the stay-at-home orders. Over 148,383 employees worked from home in January 2021 (U.S. Bureau of Labor Statistics, 2021). Some companies even plan to apply the WFH arrangement after the pandemic. WFH creates great changes in both work and life environments for employees, which may have significant effects on both their mental and physical health (Suratkon & Syahmina Azlan, 2021). Employees experienced anxiety, stress, fatigue, pains, etc. during WFH (Oakman et al., 2020), which have become national public health concerns. In particular, employees' mental and physical health is

one of the top concerns in the construction industry (Simpheh & Amoah, 2021). Some construction workers reported declined mental well-being during WFH (Pirzadeh & Lingard, 2021), while others had better mental health due to less stress during WFH (Ruff, 2020). The conflicting findings require further exploration. Then, construction-related employees' physical health declined during WFH (Suratkon & Syahmina Azlan, 2021). Many employees even considered the transition to other industries (Alsharef et al., 2021). But limited studies examined the specific physical health symptoms. In addition, demographic indicators, such as gender, age, and marital status, also impact employees' mental and physical health (Oakman et al., 2020; Shockley et al., 2021; Ustun, 2020). Therefore, this paper aims to explore the mental and physical health of construction-related employees of different demographic indicators under the effects of WFH.

Literature Review

The literature review first discussed the studies on the impacts of WFH on physical health and mental health, respectively. Then, the effects of demographic indicators were reviewed. Finally, the limitations were summarized.

Existing studies identified the impacts of WFH on physical health. Changing work environments may decrease physical health (Guo & Chen, 2020). Palumbo (2020) found that remote workers may have increased work-related fatigue and physical exhaustion. Then, there were more screen-related activities during WFH, increasing the prevalence of eyestrain (Ganne et al., 2020). Next, pains in different body parts during WFH are key problems (Ekpanyaskul & Padungtod, 2021). Majumdar, Biswas, and Sahu (2020) indicated that employees experienced physical symptoms, such as headache and discomfort of the neck, shoulder, and back, due to chronic stress, sedentary postures, and confined activities. For construction-related employees, overall physical health was decreased during WFH (Suratkon & Syahmina Azlan, 2021). However, limited work considered the specific symptoms of construction-related employees.

Existing work illustrated the mixed effects of WFH on mental health. Some studies showed that employees had better mental health during WFH, such as more job-related positive affective well-being (Anderson et al., 2015) and lower depression scores (Ustun, 2021). On the contrary, some employees experienced depression, anxiety, and sleep disorders (Arlinghaus & Nachreiner, 2014) due to the workload extension during WFH (Wu & Chen, 2020). Construction-related employees reported mental health problems during WFH, such as anxiety, stress, depression, etc. (Pamidimukkala & Kermanshachi, 2021), while another study indicated that WFH reduced the stress of workers and improved their mental well-being (Ruff, 2020). There is a need to further explore the impacts of WFH on mental health for construction-related employees.

In addition, the effects of demographic indicators on mental and physical health were discussed. During WFH, women, especially married women with children at home, showed a lower level of mental health (Shockley et al., 2021). Also, younger adults and women experienced more stress during WFH (Pieh et al., 2020). Construction-related employees of different genders, ages, and marital statuses also suffered different levels of mental and physical issues (Yang et al., 2021). But limited work explored these demographic differences among construction-related employees.

Overall, both physical and mental health are major challenges for construction-related employees during WFH (Suratkon & Syahmina Azlan, 2021). Although current studies identified the effects of WFH on mental and physical health, studies focused on construction-related employees are emerging. In particular, limited work discussed the specific symptoms and demographic differences. This study

aims to fill the gaps by exploring the specific health-related symptoms of construction-related employees under the effects of WFH considering demographic indicators.

Research Methodology

The conceptual model, as shown in Figure 1, was developed to explore the relations between WFH, mental health, physical health, and demographic indicators for construction-related employees using three hypotheses. First, existing studies identified the impacts of WFH on physical health. H1 indicates that WFH has a significant relation to physical health (four symptoms). Second, although there are conflicting findings, existing work indicated the impacts of WFH on mental health. H2 shows that WFH has a significant relationship with mental health (depression). Finally, current studies indicated demographic indicators may impact mental and physical health. H3 explains the moderation effect of demographic indicators (including gender, age, and marital status) on mental and physical health considering WFH.

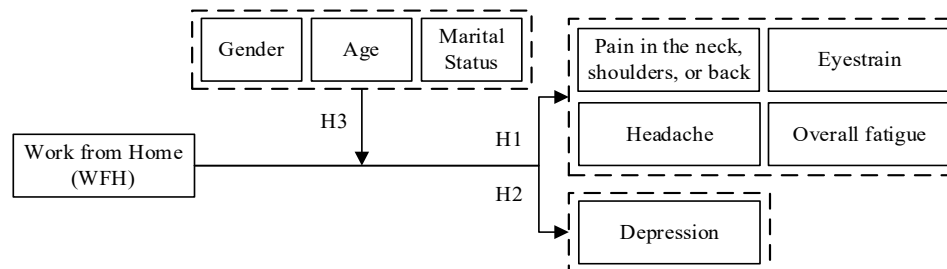


Figure 1. Conceptual model of the study

Then, an online survey was developed. After providing demographic information, each participant needed to provide two sets of responses for both (a) before WFH (i.e., regularly work on-site or in the office) and (b) during WFH (i.e., WFH during the COVID-19 pandemic) for the same variables. Four major variables were measured as follows. *Work-from-home* was dummy coded, where 0 indicates not WFH (i.e., mainly work in the office or on-site), and 1 indicates WFH. *Demographic indicators* included four factors. Gender was dummy-coded, with 1 representing man and 0 representing woman. Also, marital status was a dummy variable (0 means single or divorced, while 1 means married or lived together). Finally, based on the exact ages, age was a categorical variable (0 – 4 represent the 20-29, 30-39, 40-49, 50-59, and older than 60 age groups, respectively). *Mental health* was operationalized as depression, which is a common mental health problem. The single-item measure is an effective way to measure depression (Lefevre et al., 2012). In this study, depression was also measured using a single item: “Please rate the frequency of which you have the depression symptom before and during WFH.” The participants were asked to respond on a five-point Likert-like scale, where 1 indicated “very rare” and 5 indicated “very often.” *Physical health* was measured by top symptoms for employees ranked in the European working conditions survey (Eurofound, 2017), including (1) pain in the neck, shoulders, or back, (2) headache, (3) eyestrain, and (4) overall fatigue. They were measured by a similar single-item as depression: “Please rate the frequency of which you have the following symptoms before and during WFH.” with the same five-point Likert-like scale.

To collect data, the survey was distributed to construction-related employees in the U.S. from May 7th to May 28th, 2020. In this study, construction-related employees covered the workers from Architecture, Engineering, Construction, and Operation (AECO) industries and educational professionals related to the construction field (e.g., construction management, civil engineering, etc.).

Participants were invited in three ways: individual emails, social media, and professional associations and universities. After removing participants who were outside the U.S., provided all N/A, and were not related to the construction industry/education, there were 73 participants. 13 participants already had a full WFH arrangement (more than 5 days/week) before the COVID-19 pandemic, whose responses for (a) before WFH were removed. Another 4 participants did not have any WFH experiences, whose responses for (b) during WFH were removed. Then, the single imputation method was used to impute the item-level missing data by mean values. Finally, there were 129 responses ($129 = 73 \times 2 - 4 - 13$) from 73 participants.

Among the 73 participants, there were 58 men (81.69%) and 14 women (19.72%). One participant did not specify the information. Then, participants from the age groups of 20-29, 30-39, 40-49, 50-59, and older than 60 years were 21 (28.77%), 23 (31.51%), 10 (13.70%), 11 (15.07%), and 8 (10.96%), respectively. In addition, 50 participants were married or lived together with a significant other (70.42%), while 21 participants were single or divorced (29.58%). Two participants did not disclose this information. As for the occupations, there were 35 industry workers (47.95%, including project engineers, BIM managers, civil engineers, etc.), 19 researchers (26.03%), and 17 professors (23.29%).

The data analysis included descriptive analysis and two-way ANOVA. Two-way ANOVA aimed to explore the impacts of WFH and demographic indicators (e.g., gender, age, and marital status) on the mental and physical health of construction-related employees. Interaction plots were obtained to further show the significant differences. The PROC GLM package in SAS software was applied.

Results and Discussions

Descriptive Analysis

Participants worked from home 2.07 days/week on average before the pandemic, which changed to be 4.41 days/week during the pandemic. Although some participants can work from home even before the pandemic, such as educational professionals, COVID-19 indeed caused broad shifts to WFH. Table 1 showed the descriptive analysis of health-related variables. Participants had worse mental health (i.e., more frequent depression) and more eyestrain symptoms during WFH, while pain in the neck, shoulders, or back, headache, and overall fatigue were reduced during WFH. According to the differences in means, overall fatigue improved more obviously than other symptoms.

Two-way ANOVA Results

To test the three hypotheses, two-way ANOVA tests were performed. The results are shown in Table 2. Because WFH, gender, marital status, WFH*gender, WFH*age, and WFH*marital status did not show significant impacts on all five symptoms ($p > 0.05$), WFH, gender, and marital status were insignificant factors, and all the interaction items did not have significant impacts on all the mental and physical health symptoms. But age had a significant impact on depression ($F = 2.74, p = 0.03$), pain in the neck, shoulders, or back ($F = 3.33, p = 0.01$), and eyestrain symptoms ($F = 3.19, p = 0.02$). Thus, H1 and H2 were not supported, which indicated that WFH did not have significant relations to mental and physical health symptoms. H3 was partially supported: age was a significant factor, while gender and marital status did not have significant impacts.

Table 1

Descriptive analysis of variables before and during WFH [Mean (S.D.)]

Variables	Depression	Pain in the neck, shoulders, or back	Headache	Eyestrain	Overall fatigue
Before WFH	1.80 (1.08)	2.54 (1.32)	2.16 (1.36)	2.80 (1.38)	2.82 (1.40)
During WFH	1.92 (1.18)	2.48 (1.18)	2.02 (1.14)	2.85 (1.35)	2.62 (1.31)

Table 2

Two-way ANOVA for WFH and demographic indicators

DVs	IVs	F	P	IVs	F	P	IVs	F	P
Depression	WFH	0.27	0.60	WFH	0.34	0.56	WFH	0.43	0.51
	Gender	0.51	0.48	Age	2.74	0.03	Marital Status	0.14	0.71
	WFH*Gender	2.21	0.14	WFH*Age	0.40	0.81	WFH*Marital Status	0.65	0.42
Pain in the neck, shoulders, or back	WFH	0.01	0.90	WFH	0.07	0.79	WFH	0.04	0.84
	Gender	1.52	0.22	Age	3.33	0.01	Marital Status	0.01	0.93
	WFH*Gender	0.04	0.85	WFH*Age	0.12	0.98	WFH*Marital Status	0.07	0.79
Headache	WFH	0.08	0.77	WFH	1.03	0.31	WFH	0.17	0.68
	Gender	0.29	0.59	Age	1.45	0.22	Marital Status	0.81	0.37
	WFH*Gender	0.35	0.56	WFH*Age	0.43	0.78	WFH*Marital Status	0.44	0.51
Eyestrain	WFH	0.66	0.42	WFH	0.01	0.91	WFH	0.00	1.00
	Gender	0.03	0.87	Age	3.19	0.02	Marital Status	0.00	1.00
	WFH*Gender	1.60	0.21	WFH*Age	0.33	0.85	WFH*Marital Status	0.00	0.97
Overall Fatigue	WFH	3.18	0.08	WFH	1.25	0.27	WFH	0.75	0.39
	Gender	0.10	0.76	Age	1.82	0.13	Marital Status	0.01	0.91
	WFH*Gender	2.58	0.11	WFH*Age	0.39	0.82	WFH*Marital Status	0.02	0.89

To further illustrate the impacts of age, Figures 2a – 2c showed the interaction plots for age, WFH, and the above three symptoms. The higher the line is, the more frequent the group had the symptoms. In Figures 2a and 2c, group 2 showed the most frequent symptoms, while group 3 had the most frequent symptom in Figure 2b. Then, group 4 had the least frequent symptoms in all three figures. In addition, eyestrain symptoms showed more variances between groups than the other two symptoms. Overall, participants between 40 – 49 years old (group 2) and 50 – 59 years old (group 3) reported more frequent depression, pain in the neck, shoulders, or back, and eyestrain, while participants older than 60 years old (group 4) showed the smallest frequency of all three symptoms.

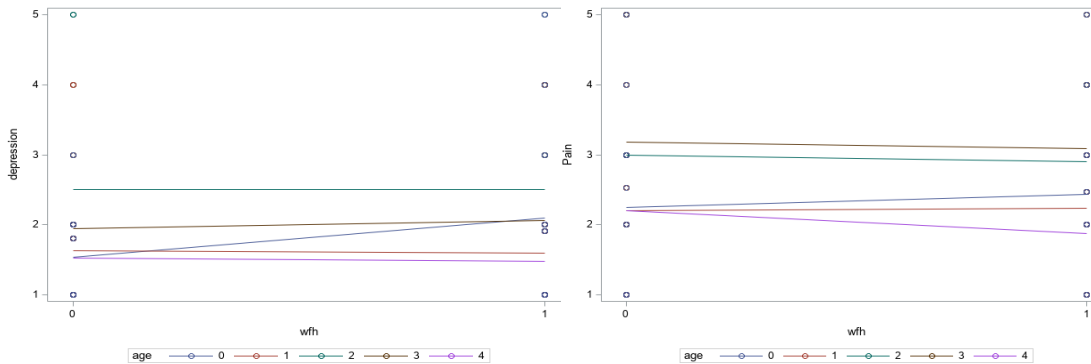


Figure 2a. Interaction plot for depression, age, and WFH

Figure 2b. Interaction plot for pain, age, and WFH

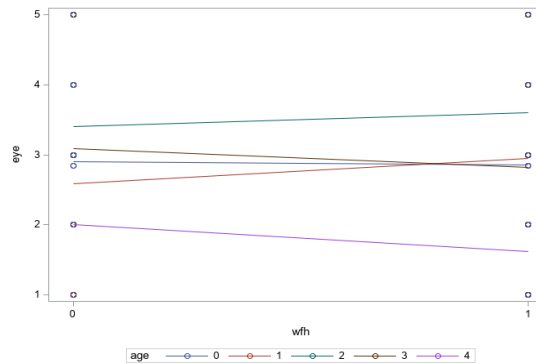


Figure 2c. Interaction plot for eyestrain, age, and WFH

Discussions

The major finding is that age was a major factor impacting the mental and physical health of construction-related employees. On the one hand, employees between 40 – 59 years old showed more frequent depression, pain in the neck, shoulders, or back, and eyestrain symptoms than participants with ages between 20 – 39 years old. Older employees had more frequent depression symptoms than younger ones due to the more possible losses in work, life, and health increased with age (Mirowsky & Ross, 1992). Also, old people were the vulnerable population during the pandemic, which may also increase their depression level. Moreover, the pain in the neck, shoulders, or back increased with age and even became chronic pains due to the accumulated work hours (Cassou et al., 2002). In addition, elder employees showed lower visual performance in digital reading tasks (Ziefle, 2001). They needed more time to finish the same visual task than younger employees, which increases their burdens in the eyes. Thus, older employees had more frequent eyestrain symptoms than younger workers, which is supported by previous findings (Zayed et al., 2021). On the other hand, participants older than 60 years old experienced the least frequent depression, pain in the neck, shoulders, or back, and eyestrain symptoms. The possible reason is that the eldest group had most past work and life experiences to deal with these health-related issues (Nwachukwu I et al., 2020).

But WFH did not show a significant impact on mental and physical health. One possible reason is that many tasks in the construction-related fields required face-to-face interactions and on-site work,

which reduced their workload (Biswas et al., 2021). Although WFH created various challenges, the reduced workload offset some negative impacts, resulting in null impacts. Similarly, gender and marital status did not show significant relations to any symptoms. It might be because that WFH allows more free time for women and married employees in the construction-related area to take on household responsibilities and balance work and life (Purwanto et al., 2020). The health-related pressure and symptoms for them during regular work were alleviated by WFH to reduce the differences in gender and marital status, leading to no significant results. Also, this study covered limited women and single participants. Significant differences will be hard to be identified.

Conclusions

WFH caused by the COVID-19 has changed the work and life environments, which impacts both the mental and physical health of employees. To explore the mental and physical health of construction-related employees considering WFH and demographic indicators, the study applied an online survey and two-way ANOVA tests. There are several key findings. First, age had a significant impact on the mental and physical health of construction-related employees. Then, employees between 40 and 59 years old showed more frequent depression, pain in the neck, shoulders, or back, and eyestrain symptoms, while participants older than 60 years old experienced the least frequent symptoms. In addition, WFH, gender, and marital status did not impact mental and physical health significantly.

As for the contribution, the results provide new insights into the impacts of WFH on the mental and physical health of construction-related employees considering specific symptoms and demographic differences. Also, the study can help improve mental and physical health under the WFH arrangements and prepare construction-related employees for future challenges. However, the study has two limitations: limited sample size and single-item measurement of health. Although the current sample size satisfied the requirement of the ANVOA test, more participants can increase the reliability of the results. Future work should also explore matrixes to measure mental and physical health more comprehensively.

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