

# Working from home in the context of COVID-19: A systematic review of physical and mental health effects on teleworkers

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## Abstract

**Introduction:** Working from home (WFH) has been endorsed in the face of the COVID-19 pandemic for all cadre of workers. This study aimed to describe the mental and physical negative effects of WFH among workers during the COVID-19 pandemic.

**Methods:** A rapid systematic review of literature was conducted on PubMed/Medline using pre-defined search terms. For inclusion in this rapid review, studies were required to focus only on previously healthy adults, white collar/professional employees, and teachers (full-time or part-time) working from home during working hours, and to include mental or physical health related outcomes of workers. Data extraction was carried out using a standardized form and included country of study, study design, details of participants, industry setting, measure used, and health outcome of interest. Overall, 1,447 articles were retrieved, and 15 of these were included in the systematic review.

**Results:** Physical effects of WFH included reduced physical activity, increased consumption of junk food, weight gain, poor sleep quality, and musculoskeletal pain. Mental effects of WFH included increased levels of anxiety, depression, stress, headache, fatigue, and lower job satisfaction. Furthermore, a significant decline in workplace comfort resulted in a reduction in workers' efficiency and job satisfaction.

**Discussion and Conclusions:** Due to the rapid stay-at-home recommendations required to break the chain of COVID-19 pandemic, WFH became pertinent for many categories of workers. Therefore, it is required that everyone identifies context-based strategies for healthy coping in ways that do not alter work functioning.

**KEY WORDS:** Anxiety; COVID-19; depression; lockdown; teleworking.

## INTRODUCTION

The effectiveness of lockdown measures in containing COVID-19 contagion and transmission has been proved, thus necessitating telework or 'working from home' (WFH) [1, 2]. This work method, which is also known as 'mobile working', 'telecommuting', 'home working' or 'remote working', allows people to work from home or other places using technological tools without time and place restrictions [3, 4]. Recently, WFH has been endorsed by the World Health Organization in the face of COVID-19 pandemic for all workers and proposed for workers with mental or physical disabilities even after the pandemic [5, 6]. Advantages of WFH include its flexibility (that may be beneficial for those who care for infants, older or sick relatives), reduced costs of travel and commuting time, and reduction of psychological stress thereby resulting in higher efficiency and productivity and an increased staff motivation [3, 7]. WFH may have even beneficial effects on the physical sphere of workers, as a study reports how

non-telecommuters are at higher risk of obesity, alcohol abuse, tobacco use and reduced physical activity than telecommuting workers [8]. In addition, WFH could be a viable and sustainable solution for coping with modern cities' issues such as traffic congestion, unfavorable environmental, social, and economic impacts [9].

In Italy, during the COVID-19 pandemic the number of teleworkers increased by 69% because of a decree of the President of the Council of Ministers (DPCM) promulgated on 11th March 2020, and directives of the Ministry of Public Administration. However, the forced remote working has been carried out unlike teleworking under normal conditions, due to prolonged nationwide lockdown, under difficult external circumstances, and with no possibilities to decide alternative ways to work. Therefore, WFH during COVID-19 emergency has been a hybrid between 'telelavoro' (home working with the application of all occupational health and safety rules at workers' home) and 'lavoro agi-

### TAKE-HOME MESSAGE

*This review showed that working from home due to the COVID-19 lockdown has a negative physical and mental effects on workers. Further longitudinal studies are needed to quantify the difference in mental/physical health status before and during the COVID-19 lockdown.*

**Competing interests** - none declared.

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le' or 'smart working' (a more flexible, mobile, objective driven work, often carried out with private devices and no dedicated training and uncertain application of occupational health and safety rules). In reduced organizational and social support, this has led to lower participation in decision-making process and task autonomy, with increased occupational stress and reduced job satisfaction [10–12]. During the pandemic, it was found that forced isolation and reduced physical activity may negatively affect physical and mental well-being, lowering job effectiveness and interfering with work-life balance [3]. Magnavita et al. showed that intrusive leadership by management during WFH can result in higher occupational stress, anxiety and depression levels and low happiness, and demands for after-hours work performance may be associated with increased levels of occupational stress [11].

Previous systematic reviews on mental and physical effects of teleworkers have been published [11, 12], but they included studies carried out before the COVID-19 emergency. In these reviews, physical health-related outcomes were musculoskeletal pain, self-reported health, and perceived safety, while mental health-related outcomes included: well-being, stress, depression, fatigue, quality of life, strain, and happiness. Also, Oakman et al. reviewed the impacts of environmental, organizational, physical, and psychosocial factors in the relationship between WFH and mental health, showing that demands of the home environment (in terms of work-family conflict), level of organizational support, and social connections external to work were important systemic moderators of this relationship [12]. In their review, some studies highlighted the influence of colleagues and organizational support (via job resources and demands) on WFH and the effect of technostress, which was defined as 'work overload, invasion of privacy, and role ambiguity' [12, 13]. De Macedo et al., in their systematic search related to ergonomics and teleworking, focused reported greater autonomy of the worker, and support for work-personal life balance as advantages

of WFH, and risk of overwork, low support from organization and colleagues, inadequate home space and higher incidence of work-related discomfort as its disadvantages [13].

Based on the foregoing, it therefore becomes pertinent to conduct research on the effects of WFH during the COVID-19 pandemic. A study of this regard is required to identify evidence-based good practices and guidelines through which labor organizations, occupational health stakeholders, and policymakers could prioritize workers' health and safety. Therefore, this rapid review aimed to describe the mental and physical negative effects of WFH among workers during the COVID-19 pandemic.

## METHODS

### *Search strategy and selection criteria*

A systematic review was conducted and reported in tandem with the PRISMA guidelines [14, 15]. The search strategy was developed in consultation with a senior librarian and, for this rapid review, was limited to PubMed/Medline. The search strategy was based on the combination of specific search terms, properly combined by Boolean operators, including those related to WFH ("working from home", "telework", "telecommuting", "remote work", "distance work", "flexplace", "virtual work", "distributed work", "flexible work") and health-related outcomes (e.g., "physical health", "musculoskeletal risk", "mental health").

For inclusion in this rapid review, studies were required to focus only on previously healthy adults, white collar/professional employees, and teachers (full-time or part-time) working from home during working hours, and to include mental or physical health related outcomes of workers. Since the review is aimed at describing WFH in the COVID-19 context only, peer reviewed journal articles published between January 2020 till date were included. Studies were excluded if they focused or included healthcare individuals, informal working from home, unemployed, students, children, population of only women,

mixed samples with healthcare, productivity outcomes (e.g., “work functioning” or “work performance”), chronic illness/disability, or pregnancy/breast feeding [12]. Although review studies and commentaries were excluded from the present review, additional eligible studies were included after a manual search of their reference lists.

The search strategy adopted the example from a previous rapid systematic review on mental and physical effects of WFH [12]. For ease of understanding, authors included only articles that had been published in English language. Only quantitative observational studies (i.e., those with cross-sectional, retrospective, case-control, and prospective design) were screened for inclusion. Second level studies (review studies), mixed-method and qualitative research were excluded, although they were examined to identify further research to be included in this review. After independently reviewing all titles/abstracts to identify potentially relevant articles, two authors (FC and IC) used the inclusion/exclusion criteria to select studies based on a full-text review. Discrepancies regarding the inclusion of some articles was resolved by deliberations with a third author (AS).

### *Data extraction and quality assessment*

Data extraction was carried out using a standardized form and included country of study, study design, details of participants, industry setting, measure used, and health outcome of interest. Figure 1 illustrates the paper extraction flow diagram for this systematic review.

## **RESULTS**

### *Description of the studies included*

In their cross-sectional study conducted among 172 administrative workers, and 300 teachers/ research staff from two Universities in Spain, Rodriguez-Nogueira et al. found that the frequency of physical activity increased significantly among women during the WFH period ( $P \leq 0.04$ ) [16].

A cross-sectional study of 161 office workers

in Estonia revealed a significant reduction in total physical activity ( $P \leq 0.001$ ) and sport-related physical activity while WFH [17].

Using a hospital anxiety and depression scale, and the Pittsburgh sleep quality index, Afonso et al. reported a high prevalence of poor sleep quality, anxiety, and depression among 143 office workers in Portugal [18].

Through the work-family conflict scale used in their study, Ghislieri and colleagues reported a positive relationship between work-family conflict and perceived technostress among administrative staff in Italy [19].

A cross-sectional study conducted by Lizana and Vega-Fernandez in Chile revealed that nearly 79% of teachers reported increased work hours due to teleworking, and 86% indicated negative effects on their work-life balance [20].

Using the modified Nordic questionnaire, it was found that more than 50% of 204 technical and administrative teleworkers who worked in the bedroom, or the dining room suffered musculoskeletal problems in the back and neck [21].

Using the RED-TIC to determine technostress levels among 3,006 teachers in Chile, Estrada-Munoz and colleagues found that 11% of teachers experienced techno-anxiety, 7.8% experienced techno-fatigue, while 6.8% had technostress [22].

In their cross-sectional study among VDT users from different industrial sectors in the Philippines, Seva et al. reported a high proportion of individuals with low back pain, neck pain, and shoulder pain. Stress had a significant negative effect on productivity ( $\beta = -0.13$ ,  $SE = 0.09$ ,  $P = 0.03$ ) [23].

A study conducted among 905 workers from 17 trade and service sector companies in Italy revealed that intrusive leadership and overtime work were associated with reduced happiness, anxiety, and depression [11].

In Italy, Moretti and colleagues found that participants who engaged in WFH were less productive, but less stressed and had higher levels of satisfaction compared to the periods of working within office environments. Neck

pain was worsened in 50% of workers who practiced WFH [3].

A study conducted among 209 employees from private and public organizations in Italy revealed a negative relationship between employees' family-work conflict and social isolation [24].

In Thailand, a cross-sectional study conducted among 869 workers from offices, universities, and non-manufacturing factories revealed a high prevalence of physical health effects of WFH such as weight gain, and shoulder/neck/back pain. Common mental health effects reported included cabin fever and anxiety [25].

A cross-sectional survey of 194 office workers in Turkey revealed a significant positive association between back pain ( $P < 0.001$ ), weight gain ( $P < 0.001$ ), and a decrease in physical activity [26].

In their study among 484 white-collar workers in Sweden, Hallman reported an association between WFH and reduced sleep time, as well as reduced work and leisure time [27]. Findings from a prospective study conducted among 162 commuters in Canada revealed that wearing a headset was not associated with a higher neck pain and/or headache in-

tensity [28].

## DISCUSSION

During the COVID-19 pandemic, WFH was proposed as a public health safety measure required to break the chain of COVID-19 transmission sequel to the knowledge that overcrowding (in work environments) could be a risk factor for COVID-19 transmission. This study identified physical health effects of the isolation among workers in both technological and other sectors. A reduction in physical activity and an increased risk of sedentary living contributed to increased food consumption [26]. As a result, weight gain was inevitable for workers even when such physical changes were not anticipated. In standard work environments before the COVID-19 pandemic, numerous additional considerations have been reported to improve the physical health of workers [29, 30]. Under normal circumstances, inter- and/or intra-unit communication of staff members in workplaces facilitate critical thinking while engaging in administrative decision making accompanied by the need to ensure smooth performance regarding the roles assigned to each unit [15]. Although unintended, these

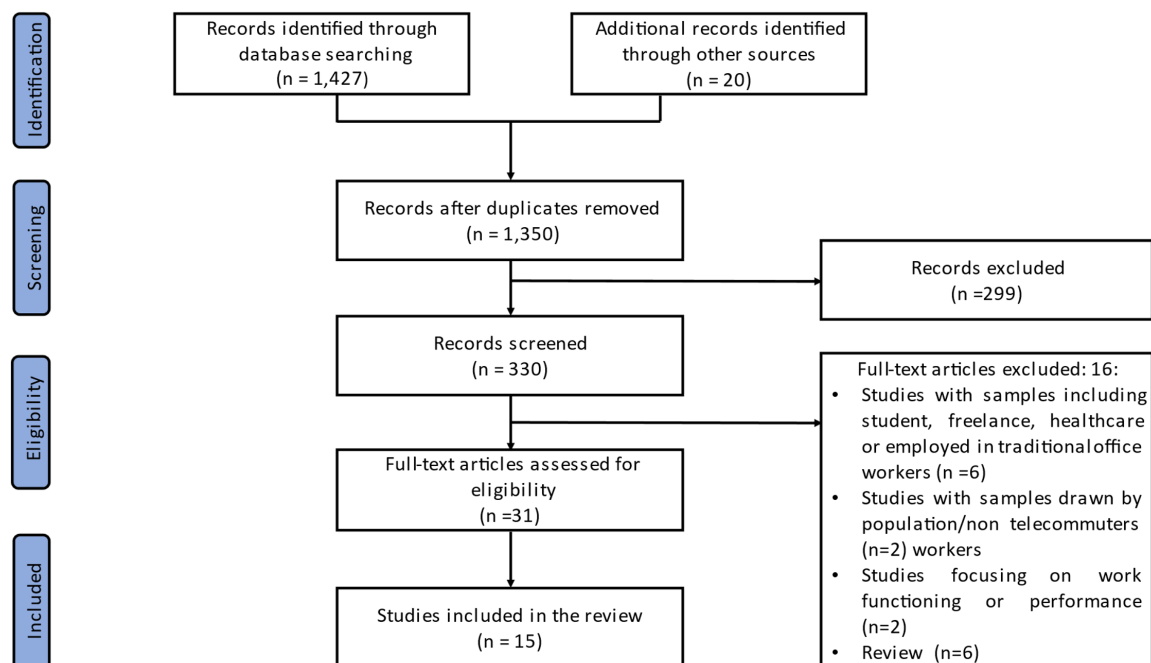


Figure 1. Flowchart for identification of studies included in the systematic review ( $n = 15$ ).

**Table 1.** Characteristics of the studies included in the systematic review ( $n = 15$ ).

Author (Date) Country of study	Study design	Participants	Type of WFH	Measures	Health outcome of the study
i. Rodriguez-No- gueira et al, 2020, Spain [16]	CS	172 administrative workers 300 teachers and re- search staff workers from 2 universities	NR	Standardized Kuorinka Modified, Nordic Questionnaire, Perceived Stress Scale.	Musculoskeletal pain was less during the confinement ( $P \leq 0.001$ ). The frequency of physical activity carried out increased significantly during the period of confinement ( $P \leq 0.04$ ), especially in women.
ii. Argus & Pää- suke, 2021, Estonia [17],	CS	161 office workers (sector of telecommu- nication, banking, and information techno- logy)	NR	Baecke Physical Activity Ques- tionnaire, Nordic Questionnaire.	No significant differences in prevalence of musculoskeletal pain before and during the lockdown were found. During the lockdown, a significant reduction in total physical activity ( $P \leq 0.001$ ) and sport-related physical activity, a significant drop in workplace comfort rating ( $P \leq 0.05$ ) and workplace ergonomics rating ( $P \leq 0.01$ ) were found.
iii. Afonso et al, 2021, Portugal [18],	CS	143 office workers of the Portuguese AESE Business school	Full time	Hospital anxiety and depression scale. Pittsburgh sleep quality index	Participants reported high prevalence of poor sleep quality, anxiety, and depression.
iv. Ghislieri et al, 2021, Italy [19],	CS	211 technical-admini- strative workers from a local health company	NR	Work-family conflict Scale by Netemeyer et al adapted	There was a positive relationship between work-family conflict and perceived technostress (related to use of information and communication technologies), off-work hours technology assisted job demands, and a negative relationship with recovery.
v. Lizana and Vega-Fernan- dez, 2021, Chile [20],	CS	336 teachers	NR	SF-36 Questionnaire	Teachers aged < 44 years showed lower deterioration risks in the Physical Component Summary and greater risk of deterioration in the Mental Component Summary than teachers $\geq 45$ years. 78.7% of teachers reported having increased work hours due to teleworking and 86% indicated negative effects on their work-life balance.
vi. Larrea-Araujo et al, 2021 [21], Ecuador	CS	204 technical and ad- ministrative workers	NR	Nordic questionnaire modified	More than 50% of teleworkers who worked in the bedroom, or the dining room suffered muscu- loskeletal problems in the back and neck. The highest incidence of back pain was in the lumbar region (68.5%) and the neck (67.1%) when working in the bedroom. Most participants from all age groups presented with more complaints than usual in the back (57.4%) and neck (58.8%), except for the group aged between 45 and 54 years.
vii. Estrada-Munoz et al, 2021, Chile [22]	CS	3,006 teachers	Full time	RED-TTC (instrument for mea- suring technostress)	11% of teachers revealed techno anxiety and 7.2% techno fatigue. 6.8% of teachers showed to be techno stressed. Fatigue and anxiety factors of the scale were higher for female teachers.
viii. Seva et al, 2021, Philippines [23]	CS	352 VDT-users from different industrial sectors	NR	Items from the Recovery Experience Ques- tionnaire and the Copenaghen Psychosocial Questionnaire COPSOQ II, Nordic Questionnaire	Most of participants reported pain and other symptoms at the lower back (74.1%), neck (67.9%), shoulders (67.3%), ankles and feet (22.6%), which were associated with prolonged awkward postu- res. Ergonomic suitability of the workstation had a significant effect on musculoskeletal symptoms ( $\beta = -0.31$ , SE = 0.07, $P < 0.01$ ). Both workstation suitability ( $\beta = -0.24$ , SE = 0.03, $P < 0.01$ ) and workstation ergonomic suitability ( $\beta = -0.18$ , SE = 0.01, $P < 0.01$ ) inversely affect stress levels. Stress had a significant negative effect on productivity ( $\beta = -0.13$ , SE = 0.09, $P = 0.03$ ).

**Table 1.** Continued.

Author (Date) Country of study	Study design	Participants	Type of WFH	Measures	Health outcome of the study
ix. Magnavita et al, 2021, Italy [11]	CS	905 workers from 17 trade and service sector companies	Part-time (< 10h per week)	Toxic Leadership Scale by Schmidt, Bergen Work Addiction Scale, Siegrist Effort/Reward Imbalance Questionnaire, Goldberg Anxiety and Depression Scale 1-item measure of happiness (method by Abdel-Khalek)	Intrusive leadership and working after hours were significantly associated with occupational stress. Workaholism is a relevant moderator of this interaction: intrusive leadership significantly increased the stress of workaholic workers. Intrusive leadership and overtime work were associated with reduced happiness, anxiety, and depression.
x. Moretti et al, 2020, Italy [3],	CS	51 office workers	NR	Utrecht Work Engagement Scale, Brief Pain Inventory, Fear Avoidance Beliefs Questionnaire	Participants were less productive (39.2) but less stressed 839.2% and equally satisfied (51%) compared to the time of the office working. Low back pain was referred by 41.2% and neck pain by 23.5% of participants. Neck pain was worsened in 50% of home workers. Home workers with musculoskeletal pain reported lower job satisfaction.
xi. Galanti et al, 2021, Italy [24]	CS	209 employees from private and public organizations	Full time	Family-work conflict scale by Netemeyer et al, Social isolation (modified scale by Golden et al.), Distracting working environment, (modified scale by Lee and Brand) Job autonomy (modified scale by Morgeson and Humphrey), Revised Self-Leadership Questionnaire, Utrecht Work Engagement Scale, Fear of Covid-19 Scale	Employees' family-work conflict and social isolation were negatively related, while self-leadership and autonomy were positively related to work-family productivity and engagement.
xii. Ekpanyaskul & Padungrod, 2021, Thailand [25]	CS	869 workers from offices, universities, and non-manufacturing factories	Full-time (every day WFH) and part-time (partly WFH and partly in traditional offices)	Self-reported measures	The most common physical health effects reported were weight gain (49.3%, CI 95% from 37.69 to 44.24), neck and shoulder pain (40.85%, CI 95% from 37.58 to 44.13) and back pain (36.35%, CI 95% from 33.05-39.45). The most common mental health effects reported were cabin fever (31.28%, CI 95% from 26.66 to 35.90), ambiguity between work and daily life (26.81%, CI 95% from 23.86 to 29.76), and anxiety from work (21.98%, 95% CI from 19.22 to 24.74).

**Table 1.** Continued.

Author (Date) Country of study	Study design	Participants	Type of WFH	Measures	Health outcome of the study
xiii. Güler et al, 2021, Turkey [26]	CS	194 office workers	Part-time (only on certain days of the week)	International Physical Activity Questionnaire, Nordic Musculoskeletal Ques- tionnaire, Visual Analog Scale	A significant increase in back pain ( $P < 0.001$ ) and weight gain ( $P < 0.001$ ) was observed connected to a decrease in physical activity and an increase in the consumption of junk food. Despite this, participants, reported an increase in productivity levels.
xiv. Hallman et al, 2021, Sweden [27]	CS (within- subjects design)	484 white-collar workers	NR	COPSOQ-III WHO-5	WFH was associated with an increase sleep time and reduced work and leisure time. Sedentary, standing and moving behaviors did not change during days WFH compared to days working at the office.
xv. Houle et al, 2021, Canada [28]	Prospective (5-days follow up)	162 telecommuters	Full-time	Headache Impact Test (HIT-6) Neck Bourne-mouth Question- naire (NBQ)	During the 5-day follow-up, 67 participants (61.4%) reported at least one headache episode, 77 (70.6%) at least one neck pain episode. Wearing a headset was not associated with a higher neck pain and/or headache intensity.

Notes: CS = Cross-sectional design, NR = Not Reported



factors helped to maintain staff health before the COVID-19 pandemic. It is therefore required that planned strategies to ensure healthy physical status of workers are adopted during lockdowns to ensure mental engagement in remote decision making.

From this review, we found a decline in work efficiency of people during WFH periods, despite working for longer hours. The underlying reasons for this observation are not far-fetched. Firstly, distractions (from children, neighbors, and relatives) cannot be avoided while WFH environments [15, 31, 32]. Although many organizations anticipated that workers should be able to optimize the relaxed conditions offered in home environments to maintain or increase their productivity levels as found in the period before the lockdown. Unfortunately, the reverse was the case as individuals had to handle stress from different scenes before setting apart time to work [33]. A decline in efficiency and productivity therefore resulted. Due to the change in work environments, many individuals had to adjust to working in different positions from home, top of which could have been lying on the bed or sitting on seats originally intended for relaxation [30, 33]. Few studies conducted among office workers before the COVID-19 pandemic revealed that office seats have been designed to handle stress and offer physical comfort to workers all day long. Little wonder people are less likely to complain of pain (on the low back, neck, or shoulder) while working from office environments before the COVID-19 lockdown.

Work-related musculoskeletal disorders have been reported to increase pain while performing official duties in home environments [34]. Although individuals are exposed to risk factors for musculoskeletal disorders in official environments, however, less pain is likely to be experienced since these duties follow a repetitive pattern. During the COVID-19 pandemic however, musculoskeletal disorders could have been worsened due to the high levels of stress borne in home environments, including pushing and pulling heavy loads, shopping, sanitation, and working in

awkward positions [35]. It has been reported that mental health disorders such as burnout, violence, and aggression increased during the COVID-19 lockdown [36, 37]. These conditions were aggravated by maintaining contact with individuals who were oblivious to one's assigned responsibilities at work. Thus, these mental disorders could have translated into musculoskeletal disorders among many. Amid these unpleasant circumstances, how then is it expected that individuals meet organizational expectations of ensuring that no decline in productivity occurs? Therefore, it is required that modalities for healthy coping (e.g., staff exercise sessions) are incorporated into organizational plans for workers during lockdowns and home isolation. It is however expected that these modalities are implemented prior to the commencement of any lockdown measure.

Underlying the findings in this review is an adage that 'investing in employees' health and digital processes implies investing in organizational production'. Although levels of fear and anxiety among workers were higher than usual, due to the health, social and economic implications of the pandemic, organizations are tasked with the responsibilities of ensuring staff health despite their absence from conventional work environments [38–41]. For this reason, positive psychological effects of working from home, such as higher work engagement, work-related flow and connectivity among staff that were described before the pandemic, could be outweighed by negative emotions and increased irritability due to social isolation during the pandemic. Likewise, low support from own colleagues when dealing with difficult tasks or working troubles, and experience of overlapping boundaries between work and home life worsened by anxiety and fear experienced during the periods of lockdown and by the constriction to share the home space with own family members could have prompted negative emotional and mental health conditions among workers [42, 43]. It is therefore required that everyone identifies context-based strategies for healthy coping with unpleasant situations in ways that do not negatively alter

work functioning. To better deal with stress, a balanced timing should be reserved to interpersonal relationships alongside spiritual moments for themselves [44–47]. Organisational social support and teleworker support by employers may reduce teleworker isolation and be associated with increased job satisfaction and reduced psychological strain in teleworkers [48]. Furthermore, preventive measures should include training of workers for better work-home boundary management, technical support, facilitation of co-worker networking, and training for managers to prevent high workloads [49].

## CONCLUSION

Due to the rapid stay-at-home recommendations required to break the chain of COVID-19 pandemic, WFH became pertinent for many categories of workers. These workers reported an increase in physical and mental health issues. Predictors of physical health status included increased intake of junk food, decreased physical activity related to work

environments, presence of distractions from home, and increased prevalence of musculoskeletal disorders resulting in pain. Predictors of mental health status included the lack of communication with colleagues at work, reduced mental engagement, and reduced emotional well-being. Therefore, factors that improve workers' physical and mental health and well-being are needed to support good WFH experiences. This will include the design of regular team meetings and virtual hang-out sessions through Skype, Zoom, or other virtual platforms to help counteract any feeling of isolation among workers. In addition, organizations are required to provide some financial compensation for employees to cover some unintended costs associated with WFH environments. Likewise, trainings should be conducted to enable easy adaptation of staff with WFH. Individual workers should prioritize inter-personal communication to improve their physical and mental health while WFH. Also, engagement in minimal exercise, either in-door or out-door will be beneficial.

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