



# COMPLICATIONS ASSOCIATED WITH REMOTE WORK DURING THE COVID-19 PANDEMIC: A QUICK REVIEW

COMPLICACIONES ASOCIADAS AL TRABAJO REMOTO DURANTE LA PANDEMIA COVID-19:  
UNA REVISIÓN RÁPIDA

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## ABSTRACT

**Introduction:** This review identifies and describes the main outcomes and complications associated with remote work during the COVID-19 pandemic. **Methods:** A systematic review of the literature was carried out. This included observational studies whose population or part carried out remote work, published between March 1, 2020 and November 30, 2020. The descriptors were adapted to MEDLINE (Ovid), EMBASE, Scopus and Psycinfo databases. We found 139 studies; 15 articles were included in this synthesis. **Results:** A total of 18,818 remote-workers were reported, of which women represented between 18.2%-100%. The findings describe the increased use of electronic devices, sedentary lifestyle, anxiety, depression, feelings of loneliness, sleep disorders and the presence of musculoskeletal pain in remote workers. **Conclusions:** Therefore, it is necessary to provide assistance and education to the remote worker in order to improve their conditions, reduce the associated complications and positively impact their lifestyle.

**Keywords:** COVID-19; Telecommuting; Physical activity; Occupational health; Musculoskeletal disorder.  
(Source: MESH-NLM)

## RESUMEN

**Introducción:** Esta revisión Identifica y describe los principales desenlaces y complicaciones asociadas al trabajo remoto durante la pandemia por COVID-19. **Método:** Se realizó una revisión de la literatura que incluyó estudios observacionales cuya población o parte realice trabajo remoto, publicados entre el 1° marzo de 2020 al 30 de noviembre de 2020. Se adaptó los descriptores a las bases: MEDLINE (Ovid), EMBASE, Scopus y Psycinfo. **Resultados:** Se hallaron 139 estudios y se incluyeron 15 artículos en esta síntesis. Se reportó 18 818 trabajadores de los cuales las mujeres representaron entre el 18.2%-100% de la población. Los hallazgos describen el incremento del uso de dispositivos electrónicos, sedentarismo, ansiedad, depresión, sensación de soledad, trastornos del sueño y dolor musculoesquelético en los trabajadores remoto. **Conclusión:** Por lo que es preciso brindar asistencia y educación al trabajador remoto a fin de mejorar sus condiciones, disminuir las complicaciones asociadas e impactar positivamente en su estilo de vida.

**Palabras clave:** COVID-19; Trabajo remoto, Salud ocupacional; Actividad física; Trastorno musculoesquelético.  
(Fuente: DeCS- BIREME)

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## INTRODUCTION

The current pandemic caused by the new coronavirus impacts the health of workers and the conditions of the workplace, who have had to adapt in order to reduce the risk of contagion<sup>(2)</sup>. Among the measures recommended at the labor level, the implementation of remote work (RT)<sup>(2,3)</sup> stands out, which urged subjects with little experience to work from home, and reorganize spaces and schedules to continue working<sup>(4)</sup>.

The job change in an unusual context has given rise to difficulties and risks in the execution of work<sup>(4,5)</sup>. Research before the pandemic shows inconclusive results between RT and associated outcomes<sup>(6-13)</sup>. Some studies show that TR provides employees with flexibility, work autonomy, stress reduction<sup>(12)</sup>, and work-home conflict<sup>(6)</sup>; in addition to improving commitment<sup>(7)</sup> and performance<sup>(8)</sup>.

However, there is also evidence of a null<sup>(14)</sup> and even negative effect of TR associated with isolating behavior, increased conflict between work and home responsibilities<sup>(15)</sup>, musculoskeletal pain<sup>(16-18)</sup>, burnout<sup>(5)</sup>, overload mental, fatigue<sup>(19)</sup>, as well as the decrease in interaction and work performance<sup>(20)</sup>. The ambiguity of

the findings can be attributed to the variability in the RT implementation processes associated with the context<sup>(21)</sup>. During the quarantine period, physical and mental health problems have been observed in people who perform RT, such as social isolation<sup>(22)</sup>, overexposure to visual screens, increased time spent sitting, decreased level of physical activity<sup>(23,24)</sup>, as well as sleep problems<sup>(25)</sup> depressive symptomatology<sup>(26,27)</sup> and anxiety<sup>(27)</sup> which need to be addressed.

Therefore, this review of the scientific literature aimed to identify and describe the outcomes associated with health in workers who perform RT in the context of the COVID-19 pandemic.

## METHODS

### Information sources

A systematic literature review was conducted to identify information and summarize relevant findings<sup>(28)</sup>. The search was performed in the MEDLINE (Ovid), EMBASE, Scopus, and Psycinfo databases. The PI/ECO format systematic search strategy was structured, incorporating controlled language descriptors (Mesh) as detailed in TABLE 1.

**Table 1.** Search strategy.

Indicator	Thesaurus/free terms
P	"Computer worker*", "office employee*", "remote-employee", "office-worker*", "computer-based worker*", "White-collar worker", "teacher*", "telecommuting", "telework", "remote Work", "home- office", "Work from home" / COVID-19, coronavirus, SARS-CoV-2
I/EO	
1*	"Musculoskeletal pain", "musculoskeletal disease*", "musculoskeletal disorder*", "musculoskeletal discomfort", "Work-related musculoskeletal disorder", "musculoskeletal injur*"
O2*	"Physical activity", "exercise", "physical inactivity", "sedentary behaviour/ behavior"
O3*	" food habits", "nutrition", "diet"
O4*	"Occupational stress", "anxiety", "depression", "psychological risk"
O5*	"postural balance", "posture"
O6*	"sleep disorder", "sleep deprivation", "sleep disturbance"

\*A strategy was created with each outcome



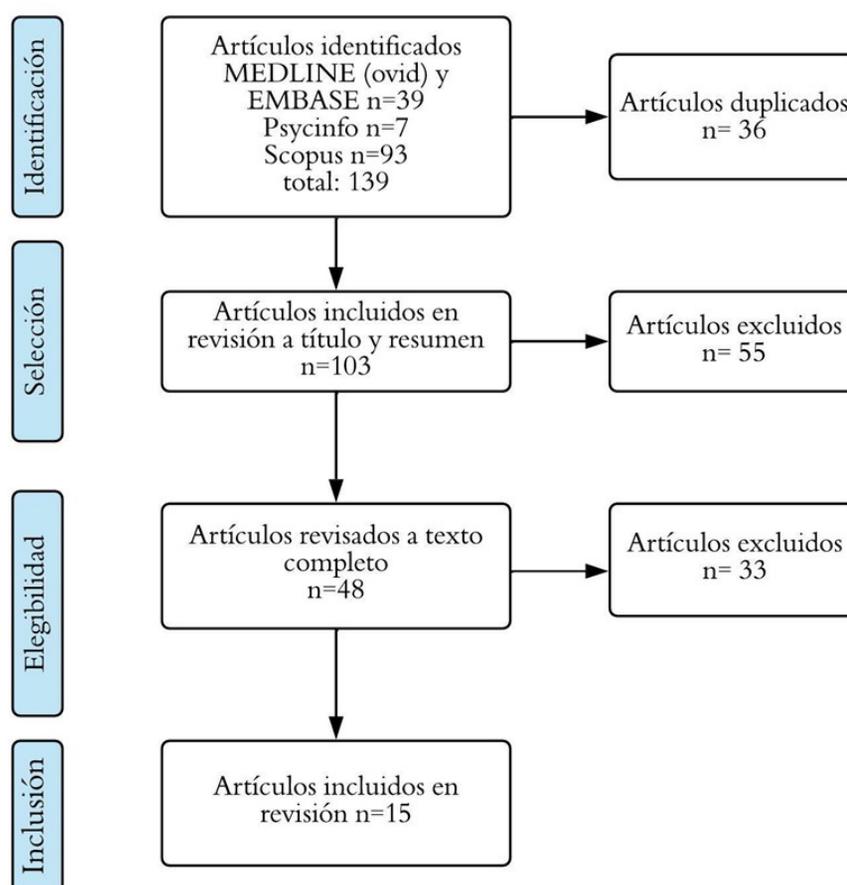
### Eligibility criteria

The search was limited to studies published from March to November 2020. The inclusion criteria were: i) Observational studies ii) the study population or part of it must be remote workers. iii) The workers must have adopted this modality after the declaration of a public health emergency of international importance (ESPII) according to the WHO<sup>(29)</sup> or during the local quarantine period. The following were excluded: i) Studies in health workers ii) language other than Spanish, English or Portuguese.

### Selection of studies

The search was carried out, and the data was exported to the Rayyan web application<sup>(30)</sup> where duplicate data was eliminated. Next, the title and abstract were read as the full text of the potentially relevant articles was to determine their eligibility (LCA, JRR).

Discrepancies were resolved by consensus. The selection process is detailed in the PRISMA flowchart in Figure 1.



**Figure 1.** Study selection flowchart according to PRISM guide.

An Excel program form was used for the extraction of the following data: author, year of publication, the population of interest, country, and description of associated outcomes observed.

### RESULTS

139 relevant references were identified and 15 articles were included in this review. 18,818 participants were reported, and the percentage of women varied

between 18.2%-100%. The outcomes associated with the health of workers who work remotely were grouped into 5 categories:

- 1) Physical activity, 2) Psychological risk factors, 3) Musculoskeletal symptoms; 4) work productivity, academic, and fatigue; 5) comorbidities and sleep disturbance.



### 1) Physical activity

The establishment of restrictive measures and change of work modality during quarantine meant a decrease in physical activity (PA) associated with the use of electronic devices, even more so in young remote workers<sup>(31)</sup>. Particularly in diabetic patients with impaired glycemic control ( $\pm 0.2\%$  of the value of their last control), the PA level was reduced by 50.9%, associated with the transition to TR and the increase in hours due to the use of devices<sup>(32)</sup>, showing an increase in sedentary behavior and adoption of negative eating habits<sup>(24)</sup>.

### 2) Psychological risk factors: Anxiety, depression, and perceived stress

The first days of adaptation to RT were characterized by a decrease in anxiety and depression in the workers<sup>(33)</sup>. Subsequent findings showed that the search for balance between work responsibilities<sup>(34,35)</sup>, family<sup>(26)</sup> transition, and decrease in PA<sup>(31)</sup>, were factors associated with increased depression. 17.9% of the variance in this was attributed to the transition to TR<sup>(34)</sup>, anxiety<sup>(31,34)</sup>, feelings of loneliness<sup>(31)</sup>, and feelings of sadness<sup>(31)</sup>.

Additionally, difficulties in accessing basic needs, limitations for the development of TR (OR= 2.04; 1.25-3.33; 95% CI), and remote learning are considered predictive factors for increased anxiety moderate to severe<sup>(36)</sup>. In particular, the increase in parental stress in mothers who migrated to this modality was associated with a decrease in quality of life<sup>(23)</sup>, and those who were displaced to work from home presented an increase from 1.9% to 14.7% in symptoms of anxiety<sup>(25)</sup>. In addition, 23.3% of workers do not agree with being able to fulfill their work responsibility from the TR<sup>(35)</sup>.

### 3) Musculoskeletal symptoms

The inadequate work environment at home, without ergonomic characteristics, determines the presence of musculoskeletal symptoms; in this sense, those who adopted the TR during quarantine presented greater intensity of pain from 1.9 to 2.3 (0-5 pts.), compared to those who did not adopt TR ( $p < 0.001$ )<sup>(37)</sup>. In addition, being between 35 and 49 years old, BMI  $\geq 30$ , being under stress, not following ergonomic

recommendations, sitting for a long time, having insufficient PA, and teleworking or distance learning were associated with greater low back pain intensity<sup>(37)</sup>. Finally, the presence of malaise and discomfort in this population, associated with a sedentary lifestyle, affects more areas, such as the neck, shoulders, wrists, back, and hips/thighs<sup>(25)</sup>.

### 4) Labor and academic productivity and fatigue

TR is considered a positive contributor, however, recent studies associate it with a decrease in self-perception, productivity satisfaction, and concern about the spread of the virus<sup>(22)</sup>, by employees<sup>(38)</sup>.

Likewise, Italian workers experienced a 39.2% decrease in satisfaction and 40.6% point to domestic distraction (housework and family care), as well as the lack of work interaction as the main disadvantages experienced during the period. TR<sup>(39)</sup>. Also, working from home increased the workload by an average of 3 hours a week (43-46 h/s)<sup>(40)</sup>, and 50.4% of faculty teachers reported that this load was associated with the presence of minor children<sup>(26)</sup>. Additionally, they reported a loss of efficiency due to technical problems with online services<sup>(40)</sup>. Therefore, the work period was extended, generating a physical and mental overload for the worker, observing a drop in academic productivity of 3.3 points<sup>(40)</sup>.

Finally, the reality of the TR exceeds the territorial limits; however, the perception varies from country and context; an example of this is the population of Taiwan which reported less productivity compared to the North Americans ( $4.4 \pm 1.2$  h. vs.  $5.2 \pm 1.2$  h.)<sup>(38)</sup>.

### Comorbidities and sleep disturbance

Changes in routine were common, even more so in the initial stage of quarantine; in this same period, there was an increase in the consumption of alcohol and cigarettes, the percentage of people with high blood pressure and gastrointestinal problems increased by 1.5% and 2.5%, respectively<sup>(25)</sup>. On the other hand, glycemic control in patients with diabetes is a challenge for public health; those patients who adopted the RT saw their glucose control levels deteriorate, experiencing an increase in weight ( $0.04 \pm 1.6$  kg) compared to reports of the first months of the pandemic<sup>(32)</sup>.



Additionally, the average use of visual screens increased by  $6.4 \pm 2.9$ h/day. at  $8.2 \pm 3.4$ h/day ( $p < 0.05$ ) pre and post-quarantine in remote workers is associated with changes in the sleep routine, in this way, a greater preference for sleeping and getting up later compared

to the pre-quarantine period has been observed. - quarantine. In addition, greater sleep disorders were manifested; 19% of workers reported feeling excessively sleepy<sup>(25)</sup>. The summary of the findings and outcomes are reported in Table 1.

**Table 2.** Summary of main findings of the studies.

Author, year	Study design	Population	Country	Findings and associated outcomes
Ferdinando Toscano y col., 2020	Transversal	265 public and private sector employees 26-35 years old (42%), 63% were women	Italia	Remote worker stress, influenced by isolation, influences decreased productivity and perceived satisfaction, moderated by concern about the virus.
Christine A. Limbers y col., 2020	Transversal	200 mothers; $33.5 \pm 6.3$ years old.	EE. UU	The increase in parenteral stress in mothers undergoing RT was associated with a decrease in quality of life.
Cillian P. McDowell, y col., 2020	Transversal analítico	1,242 remote workers, 68.6% women, 25.8% (25-34 years).	EE. UU	The transition to TR was associated with an increase in the time and use of visual screens (laptop, computer, tablets) and seated time.
Piya Majumdar, y col., 2020	Transversal analítico	203 office workers, $33.1 \pm 7.11$ years; 18.2% were women	India	Remote workers increased the use of electronic devices ( $8.2 \pm 3.4$ h/d.), seated time, depressive symptoms, musculoskeletal symptoms, sleep disturbance ( $p < 0.001$ ), and anxiety.
Bradley A Evanoff, J y col., 2020	Transversal analítico	4 131 remote workers (faculty, teachers, post-doctoral staff)	EE. UU	50.4% of faculty teachers reported increased workload, fatigue and stress in those who changed their work modality (associated with the presence of children and elderly people in care).
André O Werneck,	Transversal analítico	38,353 adult participants, 9,068 (RT: inactive + high	Brasil	Young workers present more unhealthy behaviors: physical inactivity, increased use of PC and TV, associated with: higher level

Author, year	Study design	Population	Country	Findings and associated outcomes
Miyako Kishimoto y col., 2020	Transversal analítico	168 patients with diabetes grouped into: "D" impaired glycemic control, "I" improved glycemic control, "N" unchanged. 53% in TR.	Japan	The transition to TR was associated with a decrease in physical activity in: Group "D": 50.9%, "I": 40%, "N": 35.3%. In addition to the deterioration of glucose level control and weight gain ( $0.04 \pm 1.6$ ) compared to the first months of the pandemic.
Claudia Traunmüller y col., 2020	Transversal	4126 participants (1438 in RT) $38.7 \pm 13.4$ years)	Austria	Remote workers reported lower averages for anxiety and depression ( $B = -1.31 \pm 0.57$ ; $B = -2.28 \pm 0.70$ ) $p < 0.001$ , respectively, compared to workers under normal conditions.
Elisabet Alzueta, y col., 2020	Transversal analítico	6,882 participants, 58.8% women, mean age $42.3 \pm 13.9$ years.	59 countries	Sociodemographic characteristics, exposure, habits, including the transition to TR, and others, explain 17.9% and 21.5% of the variance in the levels of depression and anxiety, respectively.
Sergio Madero Gómez y col., 2020	Transversal, exploratorio	332 participants (58.7% were women)	México	Regarding the perception of the impact of COVID at work, 23.3% disagree with being able to cover labor responsibility from the TR and 21.4% do not have the conditions to do so.



Autor, año	Diseño de estudio	Población	País	Hallazgos y desenlaces asociados
Antimo Moretti y col.,2020	Transversal	56 trabajadores, 56,9% mujeres de 46,7±11,3 años, 29,4% tiene niños menores en casa.	Italia	38.1% reported low back pain, 50% a worsening of neck pain. 40.6% refer to domestic distraction and work interaction as the main disadvantages of TR. Workers with musculoskeletal pain report lower job satisfaction.
Hongyue Wu, y col.,2020	Transversal	200 participants (32% industry sector, 68% education sector). 22% women, 26.6% between 23-39 years.	EE. UU	Remote workers experienced lower productivity by 38%, in researchers (education) it fell by 3.28 points. The workload increased by 3h/s. The average weekly working hours was 40.1± 29.2
Elaine Ruiz B y col.,2020	transversal	353 participants, 79% women, mean age: 21 years.	EE. UU	Difficulty in RT (OR = 2.04, 1.25-3.33, 95% CI) was identified as a predictor of moderate-severe anxiety.
Yuhuan Chang, y col.,2020	Transversal	778 participants (407 USA, 371 Taiwan) 66.6% and 43% were women, respectively. 36.1% (20-29 years old, Taiwan); 37.1% (30-39 years, USA)	Taiwán EE. UU	The Taiwanese population reported less productivity during TR compared to the North American population (4.4±1.2 vs 5.3±1.2).

US: United States of America, TR: Remote Work, AF: Physical Activity

## DISCUSSION

The review presented findings associated with RT in the context of the pandemic due to SARS-CoV-2, which are in turn associated with other factors. Difficulties working from home and the transition to remote learning were identified as significant predictors of moderate to severe anxiety<sup>(36)</sup>, fear and anguish generated by the morbid nature of the pandemic together with the inadequate quality of housing or working conditions<sup>(23,25,37)</sup>, could increase people's alertness and alter the perception of TR, attributing psychological risk factors to it.

Likewise, the closure of schools has forced parents to take care of their children and work in the same environment, which implies distributing school hours at home and work; this overlapping of activities amplifies psychosocial risks, such as perception of mental fatigue and labor<sup>(19)</sup>, if there is no structured work schedule<sup>(37)</sup>.

Both job perception and scientific productivity suffered declines, even more so in women<sup>(40-42)</sup>, as example the scientific productivity of manuscripts registered in SSRN (Social Science Research Network), which generated women experienced a drop of 13.2% in the first weeks of adopting TR, even more so in assistant professors<sup>(42)</sup>. It is precisely women who have received the least guidance support from universities<sup>(41)</sup>; and if we compare, during

the months of March and April, male researchers increased their number of publications in arXiv by 6.4% while women only 2.7% in the same period last year<sup>(43,44)</sup>.

Psychosocial risks are part of the adaptation to change and are more frequent when the worker has not been trained or provided with tools, which generates disadvantages that compromise their mental health<sup>(23,25,31,34)</sup>. Work fatigue, stress, anxiety, and depression must be approached from a multidisciplinary perspective, given their multicausal nature<sup>(38)</sup>.

On the other hand, the reduction in PA<sup>(31)</sup>, the increase in hours spent in front of electronic devices<sup>(32)</sup>, and the alteration in sleep quality are associated with musculoskeletal symptoms in the neck, wrists, and hands in these workers<sup>(37)</sup>. These end up constituting a source for the acquisition of comorbidities or their increase, even more so if there is poor control of people with risk factors such as diabetes<sup>(25)</sup>, so monitoring and follow-up in this population is necessary<sup>(45,46)</sup>.

On the other hand, the perception of decreased productivity and job satisfaction during RT has decreased<sup>(38,47)</sup>; however, the perspective of it is different for the employee and employer. 66% of local companies consider that productivity has been maintained and has even increased during the TR, while employees think the opposite<sup>(48)</sup>.



This would be explained in three points: first, the lack of consistent policies in TR in which at least 73% of companies lack an implementation plan<sup>(48)</sup>. Second, and at a global level, the continuous challenge of combining work and home, even more so for women, applies to the academic world, where institutional policies reaffirm the role of the male worker and ignore the needs of female personnel as mothers and workers<sup>(19,42)</sup>. Finally, leave decisions and labor participation, in which employees design their own solutions, with little or no support from the employer<sup>(42)</sup>.

Finally, the association of TR with productivity or experienced workload is debatable. The positive results are overshadowed by the findings in the context of the pandemic<sup>(19,40)</sup> associated with the period of isolation, quarantine, and social distancing, so to improve the findings, it is necessary to promote better management practices, self-management, skills in information technologies and investment in home workspaces<sup>(49,50)</sup>.

## CONCLUSION

The identification and description of outcomes

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observed in the remote worker are of interest in the context of the pandemic. Outcomes such as a decrease in labor and academic productivity, the latter higher in the female sex, added to the increase in psychosocial risk factors, sleep disturbance, and increase in the use of visual screens, are jointly due to multiple factors such as context, work situation, family and health status, so intervention strategies should consider these aspects.

In addition, evaluating the change in the levels of physical activity and sedentary behavior, with greater concern in diabetic people, is essential since it represents a risk for the acquisition of comorbidities. Finally, it is necessary to provide assistance and education to the remote worker to reduce associated complications. Given the partial permanence of TR and teleworking, it is essential to extend occupational surveillance to these work modalities in order to safeguard and positively impact the worker's health and lifestyle.

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