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Worldwide Scientific Production on Teleworking in Scopus in Times of COVID-19

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Abstract

Given the impact of COVID-19, teleworking has become an alternative work modality, so it is important to evaluate the scientific activity on the subject. Thus, the objective was to analyze the global scientific production on teleworking in times of COVID-19. Retrospective and descriptive study, whose unit of analysis was the publications on teleworking in journals indexed in the Scopus database between January 2020 and December 2021. The search was performed using the fields Article Title, Abstracts, Keywords, where 24 search terms were applied: teleworking, telecommuting, work from home, teleworking, telecommuting, work from home, online work, e-work, telecommuting, teletrabajo, trabado desde casa, trabajo online, e-trabajo, trabajo a distancia, teletrabalho, trabalho a partir de casa, trabalho em linha, trabalho electrónico, trabalho à distancia, and their relation with the term Covid-19. Likewise, 995 articles were found and 75.38% of them were original manuscripts. United States is the country with the largest scientific production with 21.21%. The Università degli Studi di Torino of Italy has published 10 papers and 80% of the articles on teleworking in times of COVID-19 have been published in quartile 1 and 2 journals. Teleworking in times of COVID-19 has been studied in several countries around the world as well as in different academic disciplines, which allows us to know progress on the subject, thereby generating policies and lines of research for the prevention of occupational hazards.

Keywords: *Scientific production, Teleworking, COVID-19, Scopus*

1. Introduction

As a result of the impact of the COVID-19 pandemic, governments around the world saw fit to impose social restriction and confinement measures to prevent crowding (El Keshky et al., 2020). This led to an increase in remote online activities, such as telehealth, e-shopping, e-learning and teleworking (Mouratidis & Papagiannakis, 2021). Precisely this new work modality, also called remote work, flexible work, work from home (Novianti & Roz, 2020) emerged as an alternative to reduce daily commuting and avoid crowding, a vital strategy to curb the spread of COVID-19 infections (Olde Kalter et al., 2021).

Teleworking refers to the professional activity without physical presence of workers in the company. Therefore, in order to do their work, methods of electronic information processing and telecommunication means are used for contact between the teleworker and his/her employer (Tapasco & Giraldo, 2016). From a human resources management point of view, teleworking was considered a strategy to promote work-life balance in organizations, allowing flexibility to balance roles on and off the job in order to generate a positive impact on employee satisfaction and commitment (Wulida et al., 2021). However, in practice, in many developing countries, there are still challenges in its regulation and implementation. (Santillán & Saavedra, 2021).

In the current situation, companies and organizations have made an effort to adjust their work modality and ensure continuity (García-Madurga et al., 2021). However, the workforce was not prepared to fully assume remote work as negative effects have arisen as those reported in Germany during the first wave of COVID-19, where teleworkers experienced cognitive overload (Schmitt et al..., 2021), 2021), also generating digital stressors in other contexts as in the case of Finnish workers (Oksanen et al., 2021), and poor creative performance in workers in Norway.

Also in Hispanic America, studies such as the case of Spain revealed that one third of households considered their teleworking spaces inadequate, which is related to lack of exclusive spaces to work, being more than one teleworker per household and poor digital resources (Cuerdo-Vilches et al., 2021). A situation similar to that experienced in Latin American countries, where it was observed that remote work in pandemic increased perceived stress, reduced work-life balance, and also affected productivity more in men than in women (Sandoval-Reyes et al., 2021).

Along the same lines, studies in Mexico, Guatemala, Honduras, Costa Rica, Colombia, Ecuador, Chile and Argentina perceived an increase in workload, requiring workers to reorganize their work and family life (Medina-Guillen et al., 2021). Similarly, another survey in 11 Latin American countries revealed that the absence of key domestic conditions and inputs such as internet connectivity, separate work environments, among others, generate additional sources of inequality for teleworking (Berniell & Fernandez, 2021).

In short, considering that teleworking is likely to be a recurrent work modality in a post-pandemic scenario, with the reports shown, it is not yet possible to determine the characteristics of the scientific production on the subject. Therefore, the analysis and identification of scientific publications from a bibliometric perspective are important in the systematization of knowledge, above all, in the development of strategies that safeguard the mental health of teleworkers (Solís-Cóndor et al., 2017) because, from an occupational risk prevention perspective, it is necessary to ensure that the practices and policies imposed by companies and organizations respect the rights of workers and do not negatively affect their welfare or social participation (Lecours et al., 2021).

In view of the above, the objective was to analyze the world scientific production on teleworking in Scopus in times of COVID-19.

2. Methods

Retrospective and descriptive study that considered as a unit of analysis publications on teleworking in times of Covid-19 in journals indexed in Scopus from January 2020 to December 2021 and whose author is affiliated to university and non-university institutions worldwide.

It was decided to use the Scopus database because it includes more than 40,804 journals from different disciplines and has a rigorous selection process, which helps to find the most relevant studies. In addition, the advantages of Scopus is easy navigation, 100% of what is indexed is included in the MEDLINE, EMBASE and COMPEDEX databases, and others, easy access to cited documents, the fact that is open to the Internet, availability of web pages and patents.

The search included all published and indexed articles using the fields Article Title, Abstracts, Keywords, using in the search terms the following words "teleworking" OR " telecommuting" OR "work from home" OR "online work" OR "e-work" OR " telecommuting" OR " teletrabajo" OR " trabado desde casa" OR " trabajo online" OR "e-trabajo" OR "trabajo a distancia" OR " teletrabalho" OR " trabalho a partir de casa" OR " trabalho em linha" OR " trabalho electrónico" OR "trabalho à distancia" and their relations with the terms: 2019-nCoV OR SARS-CoV-2 OR 2019 novel coronavirus" OR Covid-19 OR "Coronavirus disease 2019.

A Microsoft Excel database was organized with the selected documents and it included authorship, institutional affiliation, journals, type of document, country of publication and citations. In addition, with the support of the VOSviewer software, a keyword association network was created.

3. Results

A total of 995 articles published and indexed in Scopus was found. Six types of publishable documents were included in the analysis. Therefore, 75.38% of documents were research articles (table 1), which was the type of document with the highest percentage. During the last few years, articles on teleworking have been increasing notably, and the year 2021 was the year with the highest scientific production on this topic, which shows that during the studied period, the production increased by 48.54%.

Table 1: Document type of publications on teleworking in times of COVID-19

Document Type	2020		2021		Total	
	n	%	n	%	n	%
Articles	179	17.99	571	57.39	750	75.38
Conference articles	46	4.62	109	10.95	155	15.58
Review	23	2.31	32	3.22	55	5.53
Editorial	4	0.40	4	0.40	8	0.80
Note	3	0.30	11	1.11	14	1.41
Letter to the Editor	1	0.10	12	1.21	13	1.31
Total	256	25.73	739	74.27	995	100.00

Table 2 shows the countries with more than 20 articles in the studied period. The United States is the country that provides a higher scientific production on teleworking in times of Covid-19, representing 21.21% of the world production, followed by India and United Kingdom, countries that exceed 5.00% of the production.

Table 2: Countries with scientific production on teleworking in times of COVID-19

Country	2020		2021		Total	
	n	%	n	%	n	%
United states	65	6.53	146	14.67	211	21.21
India	33	3.32	76	7.64	109	10.95
United Kingdom	21	2.11	58	5.83	79	7.94
Italy	15	1.51	27	2.71	42	4.22
Australia	13	1.31	39	3.92	52	5.23
Indonesia	13	1.31	38	3.82	51	5.13

Country	2020		2021		Total	
	n	%	n	%	n	%
Spain	13	1.31	46	4.62	59	5.93
Netherlands	8	0.80	20	2.01	28	2.81
France	7	0.70	16	1.61	23	2.31
China	6	0.60	18	1.81	24	2.41
Canada	5	0.50	35	3.52	40	4.02
Romania	5	0.50	22	2.21	27	2.71
Germany	0	0.00	37	3.72	37	3.72
Japan	0	0.00	32	3.22	32	3.22
Malaysia	0	0.00	23	2.31	23	2.31
Other countries	52	5.23	106	10.65	158	15.88

In terms of productivity by institution, 138 international institutions have participated in the production on teleworking in the context of Covid-19. The list of the top 10 institutions is presented, among which the institutions of the United States and Australia stand out. In addition, 30% of these institutions are within the first 50 institutions of the QS World University Rankings 2021.

Table 3: Institutions participating in the research on teleworking in times of COVID-19

Institution	Country	QS World University Rankings 2021	Documents
Università degli Studi di Torino	Italy	308	10
University of Southern California	United States of America	121	9
Institut National De La Santé Et De La Recherche Médicale	France	-	8
UNSW Sydney	Australia	44	8
Bucharest University of Economic Studies	Romania	-	8
Harvard Medical School	United States of America	3	7
University of Occupational and Environmental Health	Japan	-	7
Universiti Teknologi MARA	Malaysia	651-700	7
Carleton University	Canada	601-650	7
The University of Sydney	Australia	40	7

Table 4 shows the list of the 10 most productive journals, among which Sustainability (Switzerland) and International Journal of Environmental Research and Public Health (journals with articles published more than 30) stand out. Regarding the thematic areas of these 10 journals, 40% are in the category of Medicine. Scientific production is concentrated in journals from Switzerland and the United States, showing that researchers from these regions prefer to produce and dissemination their research in their own environment. In addition, 80% of the journals mentioned are located in quartile 01 and 02, demonstrating high visibility and quality of their content.

Table 4: Most productive journals on teleworking in times of COVID-19

Journal	Documents	Country	Quartile	SJR 2020	Categories
Sustainability (Switzerland)	38	Switzerland	Q1	0.61	Social Sciences
International Journal Of Environmental Research And Public Health	37	Switzerland	Q2	0.75	Medicine
Frontiers In Psychology	17	Switzerland	Q2	0.95	Psychology
Amfiteatru Economic	14	Romania	Q2	0.34	Economics, Econometrics and Finance

Journal	Documents	Country	Quartile	SJR 2020	Categories
Journal Of Physics Conference Series	10	United Kingdom	Q4	0.21	Physics and Astronomy
Lecture Notes In Networks And Systems	10	Switzerland	Q4	0.17	Computer Science
Plos One	10	United States of America	Q1	0.99	Multidisciplinary
Journal Of Occupational And Environmental Medicine	8	United States of America	Q2	0.71	Medicine
BMC Public Health	7	United Kingdom	Q1	1.23	Medicine
Work	7	Netherlands	Q2	0.5	Medicine

Table 5 presents the authors who have published the largest number of studies on teleworking in Covid-19 times. Of the 162 authors, researchers such as Becerik-Gerber, Burçin; Molino, Monica and Tabuchi, Takahiro stand out, with equal or more than 5 published papers. Within the list of the top 10 authors, 50% of them are subscribed to an institutional affiliation in Japan.

Table 5: Authors with the highest production of documents on teleworking in times of COVID-19.

Author	Institution	Country	H-Index	Documents
Becerik-Gerber, Burçin	University of Southern California	United States of America	39	5
Molino, Monica	Università degli Studi di Torino,	Italy	14	5
Tabuchi, Takahiro	Osaka International Cancer Institute,	Japan	24	5
Tateishi, Seiichiro	University of Occupational and Environmental Health School of Medicine,	Japan	5	4
Toscano, Ferdinando	Alma Mater Studiorum Università di Bologna	Italy	5	4
Tsuji, Mayumi	University of Occupational and Environmental Health School of Medicine,	Japan	5	4

The 06 most cited articles on teleworking in times of Covid-19 are presented. All of them were published in 2020 and only three of them have more than 150 citations (Table 6).

Table 6: Articles on teleworking in times of COVID-19 with more citations

Document title	Journal	Year of publication	Citations in Scopus
Depression and anxiety in Hong Kong during covid-19	International Journal of Environmental Research and Public Health	2020	215
How COVID-19 and the Dutch 'intelligent lockdown' change activities, work and travel behaviour: Evidence from longitudinal data in the Netherlands	Transportation Research Interdisciplinary Perspectives	2020	172
Teleworking in the context of the Covid-19 crisis	Sustainability (Switzerland)	2020	154
The potential impact of the Covid-19 pandemic on occupational status, work from home, and occupational mobility	Journal of Vocational Behavior	2020	139
COVID-19 and racial/ethnic disparities in health risk, employment, and household composition	Health Affairs	2020	137
Impact of digital surge during Covid-19 pandemic: A viewpoint on research and practice	International Journal of Information Management	2020	115

With the 370 descriptors selected from a total of 5473 registered in the 995 documents retrieved, five

clusters are grouped. Cluster 1 (red) includes the results of studies on satisfaction of teleworking using telecommunications in times of COVID-19. Cluster 2 (green) shows the relationship of research studies conducted on occupational health in new work environments such as homes, through remote work. Cluster 3 (blue) analyzes the different studies that have been conducted on telecommunication and telemedicine during the pandemic caused by the coronavirus infection. Cluster 4 (yellow) presents the different cross-sectional and longitudinal studies that have been conducted on teleworking. Cluster 5 (purple) represents the mental health risk factors of working time and workload.

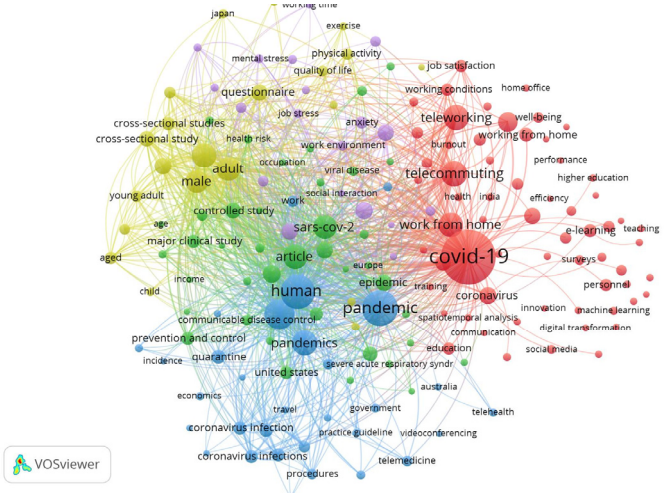

Figure 1: Cluster grouping on the basis of selected descriptors

4. Discussion

The COVID-19 pandemic has abruptly modified the different sectors of the global society, from daily life activities to work routines and models worldwide, initiating a period of teleworking (Rodriguez-Nogueira et al., 2020; Ekpanyaskul & Padungtod, 2021) performed outside the employer's premises (Messenger et al., 2019) and as a COVID-19 pandemic contagion prevention measure (Cirrincione et al., 2020). This new working model from home has been beneficial in some cases for employees, employers and society (Lyu & Wehby, 2020) but also, it has meant stress, low control limits, overtime and insufficient time (Widar et al., 2021). In this regard, it is important to study the scientific academic contributions that help to understand this new normality, so the objective of this research was to analyze the global scientific production on teleworking in times of COVID-19 in Scopus.

In light of the results obtained, 995 articles published in the Scopus database were reported, with 17.99% in 2020 and 57.3% in 2021, showing a growth of original articles and participation of the world scientific community in the topic on teleworking and its adaptation by workers, similar to other topics such as physical exercise (Vancini et al., 2021). In addition, original articles are mostly the main document found in scientific journals (Coimbra et al., 2019), although this result is not comparable with the scientific production on COVID-19, which produced about a thousand articles per week (Torres-Salinas, 2020). It is also important to note that original articles need data and cases, and it could be one of the reasons why there were not a lot of articles on teleworking as in the case of COVID-19 (Estrada-Lorenzo et al., 2021).

Among the countries with the highest scientific production in the field of teleworking, the United States clearly stands out, followed by India and United Kingdom. Studies report that, in the United States, 37% of occupations can be conducted from home (Dingel & Neiman, 2020) and that

66% of companies in the United States with 50 workers or more allow work from home (Kenneth et al., 2017). Furthermore, a high percentage of teleworkers were reported in this country in response to the COVID-19 pandemic (Barbour et al., 2021; Messenger, 2019). Likewise, studies report concern on the part of Indian employees, in which home environment was found to be uncomfortable and disruptive for sustained periods of work (Shareena & Mahammad, 2020) but an increase in creativity was found in some reports (Jaiswal & Arun, 2020).

The results at the institutional level show institutions from the United States, Europe and Australia. The Università degli Studi di Torino with its researcher Monica Molino, a specialist in work and organizational psychology, and the University of Southern California with its researcher Burçin Becerik-Gerber, a specialist in intelligent environments and data analysis, stand out among them. This result is in accordance with Lotka's law which states that the smallest number of authors publish a larger number of papers (Lotka, 1926).

Among the journals with the highest production are Sustainability, International Journal of Environmental Research and Public Health and Frontiers in Psychology, all of them from Switzerland and in the first quartiles. The journal Sustainability also leads the production in fields such as environment (Araújo et al., 2019). This result is different from what is reported in mental health journals, where the United States maintains the lead (Parmar et al., 2019). It is also important to highlight the article Depression and Anxiety in Hong Kong during COVID-19 by Choi et al. (2020), who evaluated the impact of COVID-19 on mental health, finding high levels of depression and stress and that the fact of not being able to work from home was associated with poor mental health. Likewise, the article How COVID-19 and the Dutch 'intelligent lockdown' change activities, work and travel behavior: Evidence from longitudinal data in the Netherlands by De Haas et al. (2020) reports that home-based workers increased from 6% to 39% in the Netherlands. These findings confirm that the pandemic could provoke structural behavioral changes in workers.

With respects to the selected descriptors, the first cluster referred to teleworking satisfaction in times of COVID-19 was found. In this case, teleworking satisfaction is the level to which people like their work through this modality, and various studies have documented it as a positive relationship (Schall, 2019) because it helps to understand the new experience of working from home for the first time and the level of satisfaction of this type of work (Zöllner & Sulíková, 2021).

The second cluster reports studies on occupational health in new environments such as home. From this perspective, it is important to evaluate the possible health effects of teleworking (Niebuhr et al., 2022). In addition, the importance of this issue is addressed because teleworking increases employees' positive emotions, job satisfaction and organizational commitment (Charalampous et al., 2019; de Macêdo et al., 2020).

The third cluster studies telecommunication and telemedicine during the pandemic. In this regard, studies report how governments and companies developed policies to safeguard the physical and mental well-being of workers in the new circumstances (Sandoval-Reyes et al., 2021). In addition, previous research showed a growth in using telehealth by 21% (Mouratidis & Papagiannakis, 2021), a shift from face-to-face to telehealth appointments (Wheaton et al., 2021), and the implementation of telehealth modality programs (Saintila et al., 2021).

The fourth cluster refers to cross-sectional and longitudinal studies on teleworking. Cross-sectional studies are used to determine prevalence, and are relatively quick, easy and important because many questions are efficiently answered with this method and sometimes, they are the only methods available (Mann, 2003; Levin, 2006). In the area of occupational psychology, longitudinal research designs allow for more solid conclusions about causal relationships (Taris & Kompier, 2003).

Finally, the fifth cluster corresponds to the risk factors of working time and workload in teleworking modality. Studies show effects of the workload in teleworking modality on job satisfaction (Novianti & Roz, 2020). The International Labor Organization mentions the importance of this issue and that work overload and teleworking can develop burnout syndrome risk (International Labor Organization, 2020).

This work has some limitations. First, only articles from January 2020 to December 2021 were

considered. Therefore, it is feasible that more articles have arisen in annexed periods that require additional analysis. Taking into account that the period is short, the development of bibliometric studies that analyze a longer time window, at least 5 years, is recommended. Likewise, the database used was Scopus. It is likely that more articles have been published in other databases such as Web of Science but not indexed in Scopus. Despite these limitations, we consider that the research represents a considerable contribution to the occupational and occupational health field.

This study concludes with the selection of 995 articles, 75.38% of them represent original articles. The United States, India, and the United Kingdom are the countries with the highest production, and the Università degli Studi di Torino and the University of Southern California are the leading institutions in terms of research, with publications in journals such as Sustainability and International Journal of Environmental Research and Public Health.

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