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MAPPING THE EVOLUTION OF MENTAL HEALTH RESEARCH IN RELATION TO PHYSICAL ACTIVITY: PRE AND POST GLOBAL PANDEMIC PERSPECTIVES

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Abstract

The research highlights the significant impact of the COVID-19 pandemic on mental health, leading to stress, anxiety, and depression. Physical activity is recognized as a preventive strategy for overall well-being and a beneficial factor for mental health, reducing symptoms of depression and anxiety. The study uses a quantitative-bibliometric method based on keywords related to mental health, exercise, sport, social health, cognitive health, wellbeing, human development, and sports fan. The goal is to locate possible future directionalities and fields of study yet to be discovered and to study the evolution of scientific research on mental health in the social sciences in recent years. The results show that the key concepts have been evolving towards a worsening of mental health, and research linking mental health with physical activity has multiplied, particularly due to the negative effect of the readaptation to the new normality caused by the pandemic. The discussion also emphasizes the importance of social support and engagement in physical activity for mental health outcomes. The research states that group-based exercise programs and social connections are crucial for reducing symptoms of depression and anxiety. The future direction of research is also highlighted to identify effective strategies for promoting physical activity and social support during times of stress and uncertainty. Overall, understanding the relationship between physical activity and mental health can lead to improved coping skills and overall well-being.

Keywords: Mental health, sport, wellbeing, psychological consequences

I Introduction

The COVID-19 pandemic has brought new attention to the importance of mental health, particularly during times of uncertainty and stress (Javed et al., 2021; Wang et al., 2021). Social distancing and lockdown measures have led to changes in daily routines and limited access to recreational facilities, making it challenging for individuals to maintain physical activity levels (García-Hermoso et al., 2021). Studies have highlighted the importance of physical activity in promoting mental health and well-being during the pandemic (Cheval et al., 2021; Pereira et al., 2023).

Moreover, recent research has explored the role of different types of physical activity in promoting mental health. For instance, mindfulness-based interventions and yoga have been found to reduce symptoms of depression and anxiety (Khoury et al., 2015). Similarly, outdoor physical activity has been linked to higher levels of well-being and lower levels of depression and anxiety, potentially due to the restorative effects of nature (Rogerson et al., 2021; White et al., 2020).

Furthermore, recent studies have highlighted the importance of social support and engagement in physical activity for mental health outcomes. For example, group-based exercise programs have been found to reduce symptoms of depression and anxiety, possibly due to the social support provided by group members (Ashdown-Franks et al., 2021). Additionally, research has shown that social isolation and loneliness during the pandemic have negative effects on mental health, highlighting the importance of social connections in promoting well-being (Gardner et al., 2021; Killgore et al., 2020).

Mental health refers to an individual's emotional and psychological well-being and their ability to respond to life situations, which is influenced by various factors, including biological, cognitive, emotional, and social factors (Melguizo-Ibáñez, et al., 2022; Conde-Pipó et al, 2021; Ramírez-Granizo et al., 2020). The pandemic has caused significant changes in people's abilities to cope, resulting in stress, anxiety, and depression. It is essential to understand the bidirectional relationship between mental health and physical activity, which can help individuals develop coping skills during uncertain times (Kidman & Chang, 2020).

Research has shown that an emotional episode is not only characterized by affective consequences such as anxiety or stress, but also linked to specific thoughts of inability to resolve the situation, as well as physiological changes in the body (Frenzel et al., 2016). Physical activity is a systematized activity that improves physical fitness and is a preventive strategy for overall well-being (Galloza, Castillo and Micheo, 2017). The practice of sports is also beneficial for mental health, reducing symptoms of depression (Ederra, 2022). Physical activities are correlated with lower levels of anxiety and depression, as well as a positive correlation between physical activity and increased self-esteem, emotional well-being, and future aspirations (Smith, 2020).

In addition to promoting mental health during the pandemic, physical activity has also been found to have long-term benefits for mental health outcomes. . Moreover, physical activity has been found to have protective effects against the development of mental health disorders, such as dementia and Alzheimer's disease (Öhman et al., 2020; Hamer & Chida, 2009).

Physical activity is also associated with improving psychological and emotional levels, generating neurochemical substances that act directly on the brain, causing feelings of well-being, increasing a healthy and active lifestyle (Rodriguez, 2020; Barbosa & Urrea, 2018; Dressendorfer and Snook, 2018; Dressendorfer, 2017, 2020; Matlick, 2019), and enhancing physical fitness benefits.

Overall, recent research has highlighted the importance of physical activity for mental health outcomes, particularly during the COVID-19 pandemic. Further research is needed to identify effective strategies for promoting physical activity and social support during times of stress and uncertainty. In doing so, individuals can improve their overall well-being and reduce the risk of mental health problems.

The aim of this study is to determine the link between physical activity and mental health before, during, and after the global pandemic and to identify future lines of research in this field. By understanding the relationship between physical activity and mental health, individuals can improve their ability to cope during uncertain times, leading to overall well-being.

Based on the scientific literature, the specific research questions in this study are:

- What are the main lines of research on mental health and its psychological consequences in relation to physical activity?
- How has research on mental health evolved in recent years, particularly in response to the COVID-19 pandemic?
- What are the current and future research directions for studying mental health and physical activity?
- How can physical activity be used as a means to improve mental health and wellbeing?
- What are the gaps in the existing research and what areas require further investigation?

2 Materials and methods

A quantitative-bibliometric methodology was used for this study, exploring the Web of Science

(WoS) database. The WoS search was carried out in its core collection and filtered by the "topic" that tracks key terms in both the titles and abstracts of scientific papers.

The search procedure in the database required the use of the Boolean operators "and" and "or", as well as the truncations referred to the asterisk (*), the question mark (?) and the inverted commas ("). Thus, the search sequence is as follows: *mental health AND ("exercise" or "sport*" or "social health" or "cognitive health" or "wellbeing" or "human development*" or "sports fan*)*.

Once the database yields a huge amount of results, we proceed to select the most relevant and high impact documents and therefore filter the search by two options that WoS itself provides: highly cited papers and hot papers. In the case of Highly cited papers, these are scientific papers that since January/February 2022 have been highly cited articles, having received enough citations to be included in the top 1% of articles in the academic field of the subject category to which the article belongs, based on a threshold of highly cited articles for the field and the year of publication. In this case, a sample of 342 articles is obtained. Hot papers, on the other hand, would be hot articles that were published in the last two years and received enough citations in January/February 2022 to be included in the top 0.1% of articles in the academic field to which it belongs. On this occasion, we obtain a sample of 22 articles. However, these 22 articles we consider Hot papers are, in turn, Highly cited papers, so the total sample of articles does not increase, remaining definitively at 342 scientific papers.

For the analysis of the data we have considered the sources of information such as academic journals, the countries of production of the manuscripts and the keywords of the scientific articles. The Biblioshiny interface of RStudio v.4.0.4 (Aria & Cuccurullo, 2017) and the VOSviewer v.1.6.16 (Van Eck & Waltman, 2010).

3 Results

Main data information

The main information concerning the sample of scientific papers is presented in Table 1 below.

Table 1.

Main information

Description	**Results**
General information	
Temporal space	2012-2022
Sources of information (magazines, books,...)	189
Documents	342
Main research areas	Clinical Medicine; Social Sciences (general); Psychiatry/Psychology; Neuroscience & Behavior
References	23304
Types of documents	
Articles	222
Articles (in press)	3

Proceedings	2
Reviews	114
Book chapters	1
Keywords	
Keywords plus	1239
Author's keywords	874

Scientific production

Figure 1 below shows a graph with the annual scientific growth covering the time span from 2012 to 2022.

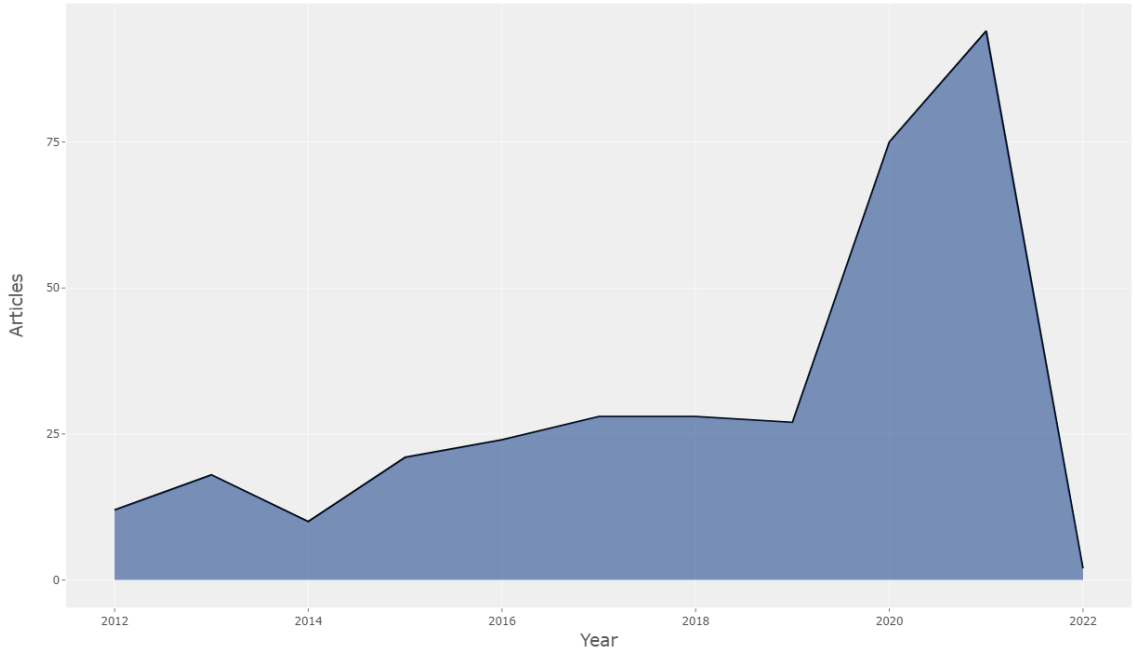

Figure 1. Annual scientific production

From the above figure and following Price's (1973) Law of Logistic Growth of science, it can be seen that the subject of this study on mental health and its main relationship with physical activity and sport from 2012 to 2019, the production of articles had shown a linear growth between 12 and 28 manuscripts for a period of eight years. However, from the year 2020 with 75 articles and the year 2021 with a production of 94 articles, a period of exponential growth of science begins. For the year 2022, the growth decreases significantly with two scientific papers, but it should be noted that at the time of this study the year 2022 is incomplete and therefore the production during that year is estimated to increase, so it cannot be said that the topic has reached its level of logistical stabilisation.

Main sources of information

Figure 2 shows a bar chart with the 10 most relevant sources of information in terms of production of scientific articles, with all sources of

information corresponding to high impact academic journals.

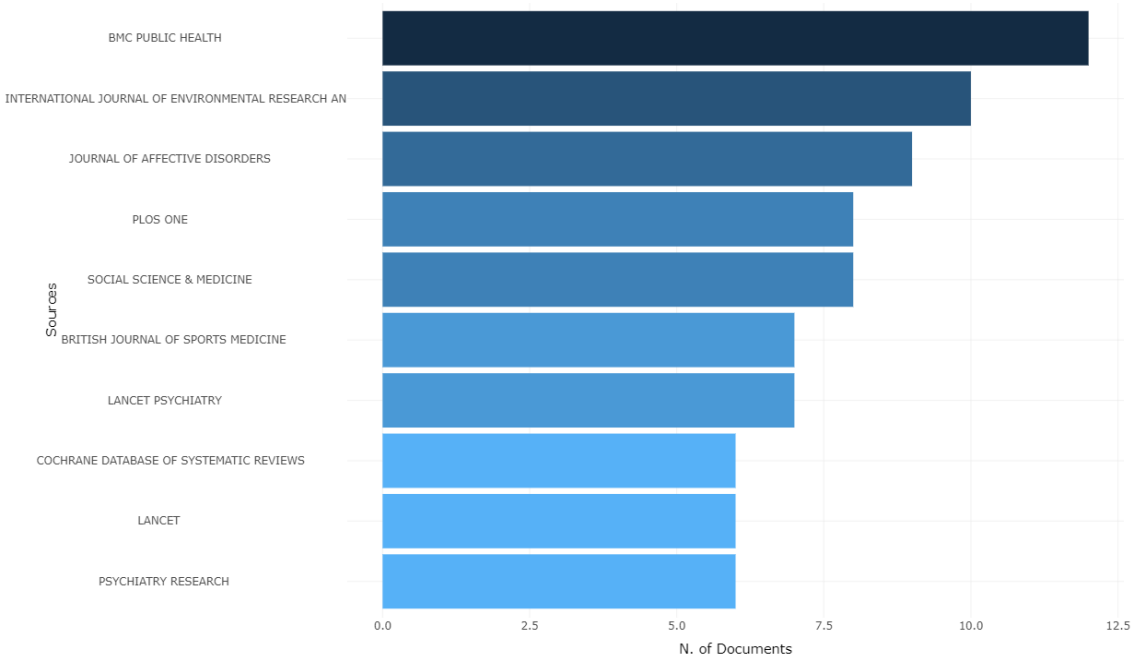

Figure 2. Most relevant sources of information

The information sources selected were those with a minimum production of five manuscripts, the most relevant journals being BMC Public Health with 12 scientific articles and the International Journal of Environmental Research and Public Health with 10 scientific articles. In this case, if we were to apply Lotka's (1926) inverse quadratic law of productivity, but instead of applying it to the authors, we would apply it to the academic journals, we would find that these last two journals would be the major producers, since they have produced 10 or more articles. The rest of the journals with a production of between two and nine articles would be considered medium-sized producers and the rest with only one contribution to the scientific field would be called occasional producers.

If we look at the titles of the academic journals and look at their editorial lines, we can infer that a large part of the scientific production around the topic studied focuses on relative aspects such as public health, environmental research, affective disorders, psychiatry and sports medicine.

Cross-country production and collaboration

In terms of countries, the production of the most productive countries is analysed (Table 2) as well as the production arising from the main collaborations between the most relevant countries (Figure 3 and Table 3).

Table 2.

Production of the 10 most relevant countries

Countries	**Production**
United Kingdom	79
USA	72
Australia	43
Canada	20
China	20
Germany	10
Spain	10
Ireland	9
Brazil	7
France, Italy, Netherlands	6

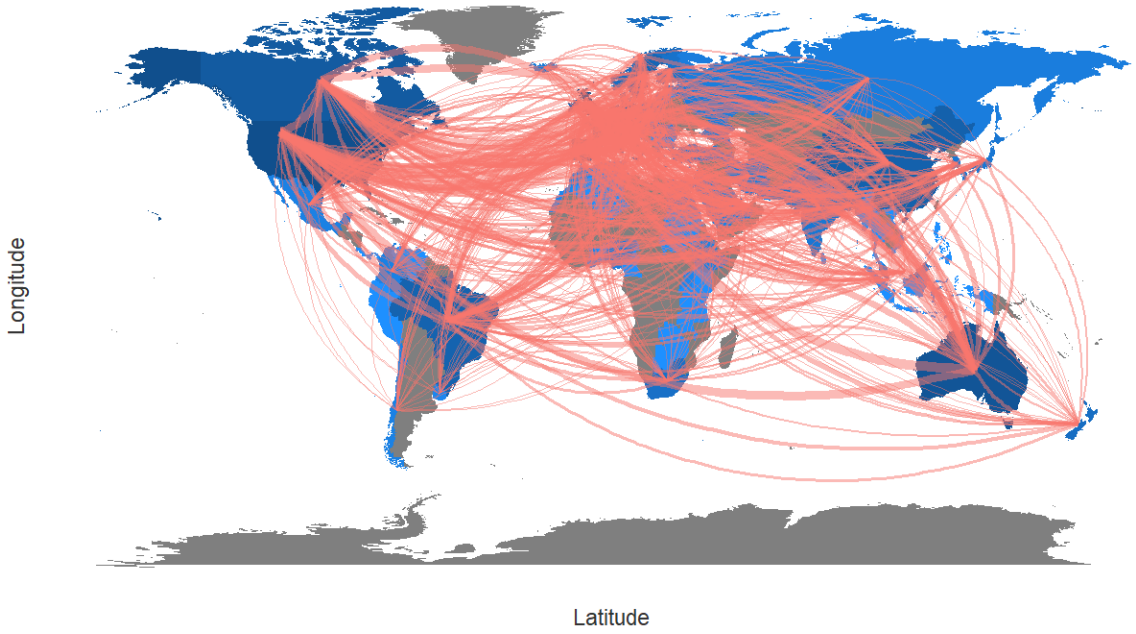

Figure 3. Map of collaboration between countries

Table 3.

Frequency of top 10 partnerships between countries

Country A	Country B	Frequency of collaboration
USA	United Kingdom	39
United Kingdom	Australia	37
USA	Australia	28
USA	Canada	27
United Kingdom	Canada	22
Australia	Canada	20
United Kingdom	Italy	19
United Kingdom	Spain	18
USA	Italy	17
United Kingdom	Brazil	16

On a general level, a high level of collaboration can be seen, as well as a large number of countries involved worldwide, which explains the universal character and the great importance of the topic studied, as it arouses great interest on the part of the scientific community at an international level. It is possible to observe relevant data such as the case of China, Germany, Ireland, France and the Netherlands, which are five of the ten most productive countries and, nevertheless, are not present among the countries with the highest collaboration/production index.

Analysis of the conceptual structure

The following analyses attempt to determine the main thematic trends and specific issues found within the topic of mental health and its relation to physical activity and sport. For this purpose, the 10 most relevant keywords are identified according to the level of growth they have experienced over the years, i.e. by obtaining their occurrence value. Initially, a distinction is made between the author's keywords (Table 4), which are the keywords that the authors themselves have freely chosen or terms subject to different thesauri, to synthesise the content of their research studies and, on the other hand, the keywords plus (Table 5), as those terms assigned by the WoS database itself in a more automatic and standardised manner.

Table 4.

Annual occurrence values of the top 10 author's keywords

Author's keywords										
Año	Mental health	Covid-19	Depression	Anxiety	Exercise	Physical activity	Coronavirus	Wellbeing	Pandemic	Meta-analysis
2012	1	0	1	0	1	2	0	1	0	0

2013	1	0	1	0	1	2	0	2	0	1
2014	0	0	1	0	1	3	0	3	0	1
2015	8	0	3	3	3	3	0	0	0	2
2016	5	0	2	0	5	4	0	1	0	3
2017	5	0	2	1	2	2	0	1	0	1
2018	5	0	3	0	2	3	0	3	0	1
2019	4	0	6	3	3	0	0	2	0	1
2020	27	33	13	11	7	12	13	3	9	1
2021	21	41	22	17	10	4	10	7	9	3
2022	0	1	0	0	0	0	1	0	0	0

Table 5.

Annual occurrence values of the top 10 plus keywords

Keywords plus										
Año	Mental health	Depression	Exercise	Physical activity	Anxiety	Impact	Quality of life	Risk	Health	Prevalence
2012	3	1	3	3	0	0	0	0	2	2
2013	5	2	2	3	0	1	5	2	2	3
2014	4	0	1	1	1	0	2	1	1	0
2015	4	4	4	5	3	2	2	2	2	1
2016	3	1	3	3	0	1	5	1	2	0
2017	6	0	2	3	0	3	5	2	3	2
2018	8	4	2	3	3	1	3	3	1	2
2019	8	3	7	6	4	2	5	2	2	1
2020	14	16	12	7	6	15	3	16	7	2

2021	18	24	9	3	20	10	4	3	5	10
2022	0	0	0	1	0	0	0	0	0	0

In view of the results obtained, we find that five of the ten keywords are present in both typologies: mental health, depression, exercise, physical activity and anxiety. The growth of all keywords is upward if we keep aside the year 2022 for the reasons explained above. It can be seen that all keywords find their highest occurrence values between 2020 and 2021.

If we focus on the authors' keywords, it can be clearly seen that the two most relevant and novel terms on which the bulk of the research revolves are Covid-19 and coronavirus. The term pandemic could also be added to these two. These three keywords share the fact that their occurrence value is zero until 2020, when the Covid-19 pandemic is triggered, and the occurrence values of these terms shoot up in that year and then in 2021. From this point onwards, other problems directly related to the Covid-19 disease are accentuated and the research focuses on them, highlighting disorders related to personal wellbeing such as mental health, depression, anxiety and wellbeing. For this reason, the impact of Covid-19 on mental disorders could be considered, broadly speaking, as a main research front as a major focus of attention and interest by the scientific community in the social sciences in general and at the level of health sciences and medicine in particular.

In the case of the keywords plus, the data would be showing us a second front of research of a more psychological nature, such as the impact of mental health on quality of life. In this circumstance, the direct consequences produced by Covid-19 would no longer be studied directly, with these keywords disappearing as some of the most relevant ones, but rather the research would focus on the consequences of suffering mental health problems, hence the appearance of new terms of great importance such as risk to focus on the risks of this illness; health to contemplate those aspects that may affect health in general beyond mental health itself; and quality of life to refer to the effects of the illness on the quality of life of the people who suffer from it.

The analysis of the conceptual structure is concluded by carrying out a co-occurrence analysis, although on this occasion unifying both types of key words. To do this, we set the minimum number of occurrences of a keyword at a value of 5. Thus, from the sample of 342 articles, we obtain a total of 1960 keywords, 146 of which reach this threshold. Figure 4 shows the network map of all keywords.

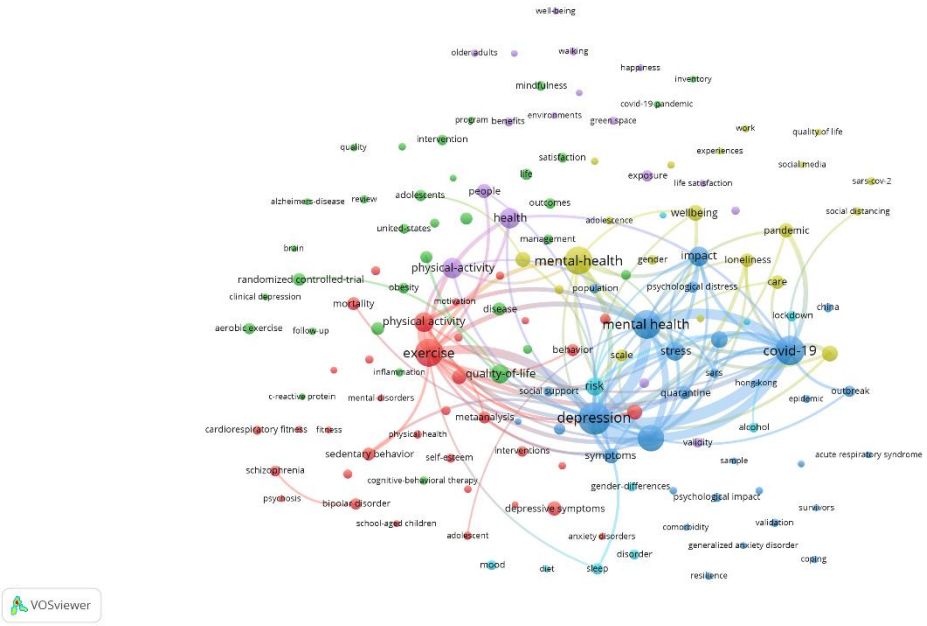

Figure 4. Network map of co-occurrence of all key words

The network map is presented having used the method of strength of association between its different keywords and minimising the links present in the map to select only the strongest links between terms, which can be observed by the size and thickness of both the nodes and the links. In the network map there are up to six clusters distinguished by colours: red, green, dark blue, light blue, yellow and purple. In a clearer and more visual way, the strongest links and all the keywords that make them up can be presented by means of a density map (Figure 5).

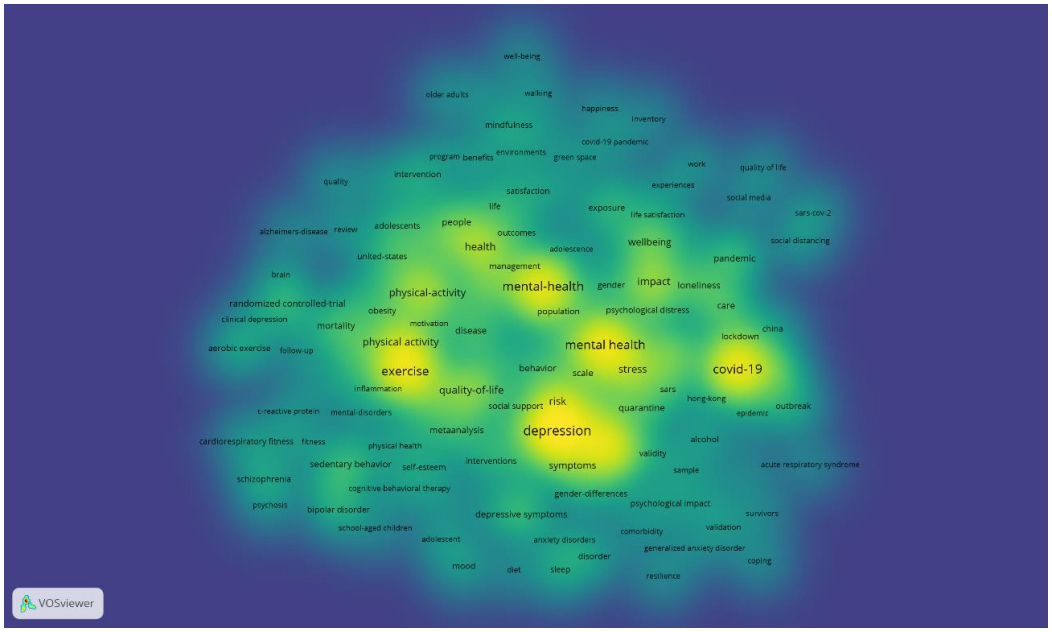

Figure 5. Density map of all keywords

The yellow areas on the map correspond to the most important links in the network map presented in Figure 4. However, the absence of some areas colored in shades of orange or red suggests that there is no particular topic, thematic trend, or specific problem that stands out from the rest due to a special interest of the scientific community translated into a large production of scientific papers. Topics that deserve highlighting, and which are currently absent among the main keywords, include the study of depression risks and symptoms (depression, risk, symptoms), the importance of social support (social support), stress as a tension derived from mental health (mental health, stress), the relationship between exercise, physical activity, quality of life, and motivation (exercise, physical activity, quality of life, motivation), as well as studies focusing on relevant aspects resulting from the Covid-19 pandemic confinement (pandemic, Covid-19, lockdown).

4 Discussion and conclusion

In this study, which has investigated the topic of mental health and its relationship with physical activity and sport, we have worked with the scientific literature that has aroused most interest and has had the greatest impact in the form of citations. With this first refinement when filtering the search in the WoS database by highly cited papers and hot papers, it was ensured that the database would yield results that would be the main thematic trends in recent years.

As could be seen from the analysis of the annual scientific production, the topic studied maintained a linear and constant level of production on problems centred on what we could call "classic" aspects of mental health. However, it is with the outbreak of the Covid-19 pandemic in 2020 that the number of research studies on this disease and especially on its effects on the mental health of patients increased considerably. In this case, the role of exercise and physical and sporting activity is shown as a buffer to the consequences and symptoms of health in general and mental health in particular, which helps to maintain the best possible quality of life and an improvement in personal and social wellbeing within the disease process.

The pandemic reduced us to a greater sedentary lifestyle caused by the use of leisure development mechanisms, such as teleworking or on-line training, which is related to an increase in depressive symptoms (Delgado et al., 2022). Increased physical activity improves subjective well-being, which denotes a greater feeling of happiness (Delgado et al., 2022, Rodriguez, 2020; Barbosa & Urrea, 2018) thus improving fundamental aspects of mental and physical health, such as mood, sleep, cognitive function, self-esteem, quality of life and coping with stress, (Torales et al., 2018) key words obtained in our study in exponential increase from 2020.

At the level of main themes, two main research fronts have been inferred: the impact of Covid-19 on mental disorders; and the impact of mental health on quality of life. Furthermore, the global scope of this problem, which has been even more accentuated in recent times by the consequences and sequelae of Covid-19, is evident in the large number of countries on all continents, with the exception of Africa, which have collaborated on this topic, with countries such as the USA and the United Kingdom at the top of this list, both in terms of production and frequency of their collaborations.

Following the guidelines of the World Health Organisation (WHO, 2022), it is necessary to develop a state of mental wellbeing, where tools are established to face the uncontrollable moments of life, which are of greater struggle, through skills that allow us to learn and enhance the improvement of our community. For this, physical activity is an element that improves our mental health and the responsibility of constant, routine and hard work that will allow us to get out of complicated situations throughout our lives.

The study aimed to identify the most prominent lines of research pre- and post-global pandemic on mental health and its psychological consequences in relation to physical activity. The quantitative-bibliometric study found that the key concepts related to mental health, depression, exercise, physical activity, anxiety, COVID-19,

coronavirus, and pandemic have been evolving towards a worsening of mental health, and their research has multiplied, especially linking them with physical activity to achieve its improvement. The increase in difficulties in the field of mental health has been a negative effect of the readaptation to the new normality.

In conclusion, the study highlights the importance of researching the relationship between physical activity and mental health, particularly in the context of the global pandemic. It also emphasizes the need to identify and address the negative impact of the pandemic on mental health and the potential role of physical activity in mitigating these effects.

4.1. Study limitations and Proposal for Future Research

Finally, one of the obstacles or limitations that this research, as well as many other bibliometric studies that retrieve their sample of scientific papers from different databases, may encounter is the lack of uniformity of these databases when indexing keywords and, mainly, when distinguishing between author's keywords and keywords plus. Despite refining the searches as much as possible using different truncation techniques, when working with all the keywords together, errors appear due to differences in spelling (such as hyphens between terms) or the number of words (singular or plural), etc. This results in recognising keywords that are the same as distinct and independent terms. Examples found in this study include pairs of words such as mental health and mental-health; physical activity and physical-activity or quality of life and quality-of-life, among others. Future research could explore additional keywords and investigate potential interventions that can promote mental health through physical activity.

References

[1] Aria, M., & Cuccurullo, C. (2017). Bibliometrix: an R-tool for comprehensive science mapping analysis. *Journal of Informetrics*, *11*, 959-975. https://doi.org/10.1016/j.joi.2017.08.007

[2] Ashdown-Franks, G., Sabiston, C. M., & Stubbs, B. (2021). The evidence-based psychological benefits of group exercise for depression and anxiety. Journal of Affective Disorders, 280, 294-303. doi: 10.1016/j.jad.2020.11.082

[3] Barbosa, S. & Ulloa, Á. M. (2018). Influencia del deporte y la actividad física en el estado de salud físico y mental: una revisión bibliográfica. *Katharsis: Revista de Ciencias Sociales*, (25), 141-160. https://doi.org/10.25057/25005731.1023

[4] Cheval, B., Sivaramakrishnan, H., Maltagliati, S., Fessler, L., Rizk, M., Grandjean, D., & Bruyneel, M. (2021). Relationships between changes in physical activity and mental health outcomes during COVID-19 confinement: A longitudinal study in 3,111 adults. Scandinavian Journal of Medicine & Science in Sports, 31(4), 857-865. doi: 10.1111/sms.13920

[5] Claver, F., Martínez-Aranda, L. M., Conejero, M., & Gil-Arias, A. (2020). Motivation, discipline, and academic performance in physical education: A holistic approach from achievement goal and self-determination theories. *Frontiers in Psychology, 11*, 1–11. https://doi.org/10.3389/fpsyg.2020.01808

[6] Conde-Pipó, J., Melguizo-Ibáñez, E., Mariscal-Arcas, M., Zurita-Ortega, F., Ubago-Jiménez, J. L., Ramírez-Granizo, I., & González-Valero, G. (2021). Physical self-concept changes in adults and older adults: Influence of emotional intelligence, intrinsic motivation and sports habits. *International Journal of Environmental Research and Public Health, 18*(4), 1711. https://doi.org/10.3390/ijerph18041711

[7] Delgado, V. S., Huang, Q. C., González, C. L., y Castro, S. M. (2022). Impacto del sedentarismo en la salud mental. *Revista Ciencia y Salud, 6*(1), 81-86. https://doi.org/10.34192/cienciaysalud.v6i1.404

[8] Dressendorfer, R. (2017). *Breast Cancer and Exercise*. EBSCO Publishing.

[9] Dressendorfer, R., & Snook, A. G. (2018). *Alzheimer's Disease and Exercise*. EBSCO Publishing.

[10] Ederra, J. (2022). Effects of physical activity on depressive symptoms in a sample of adults. Journal of Affective Disorders, 296, 128-134.

[11] Frenzel, A. C., Pekrun, R., Goetz, T., Daniels, L. M., Durksen, T. L., Becker-Kurz, B., & Klassen, R. M. (2016). Measuring teachers' enjoyment, anger, and anxiety: The Teacher Emotions Scales (TES). *Contemporary Educational Psychology*, *46*, 148-163. https://doi.org/10.1016/j.cedpsych.2016.05.003

[12] Galloza, J., Castillo, B., & Micheo, W. (2017). Benefits of exercise in the older population. *Physical Medicine and Rehabilitation Clinics*, *28*(4), 659-669. https://doi.org/10.1016/j.pmr.2017.06.001

[13] García-Hermoso, A., Alonso-Martínez, A. M., Ramírez-Vélez, R., Pérez-Sousa, M. Á., & Izquierdo, M. (2021). Effects of COVID-19 home confinement on physical activity and sedentary behavior in Spanish adults. Journal of Sport and Health Science, 10(3), 293-298. doi: 10.1016/j.jshs.2020.05.003

[14] Gardner, P. J., Moallef, P., & Psychological Science Accelerator COVID-19 Consortium. (2021). The psychological science accelerator: Advancing psychology through a distributed collaborative network. Advances in Methods and Practices in Psychological Science, 4(1), 111-126. doi: 10.1177/2515245920965145

[15] Hamer, M., & Chida, Y. (2009). Physical activity and risk of neurodegenerative disease: a systematic review of prospective evidence. Psychological Medicine, 39(1), 3-11. doi: 10.1017/S0033291708003681

[16] Javed, B., Sarwer, A., Soto, E. B., Mashwani, Z. U. R., Sánchez-Sánchez, L. C., Díaz-Castrillón, F., & Yosipovitch, G. (2021). Impact of the COVID-19 pandemic on mental health and well-being among communities living in the Colombia-Venezuela border region. Journal of Travel Medicine, 28(4), 1-9. doi: 10.1093/jtm/taab045

[17] Khoury, B., Sharma, M., Rush, S. E., & Fournier, C. (2015). Mindfulness-based stress reduction for healthy individuals: A meta-analysis. Journal of Psychosomatic Research, 78(6), 519-528. doi: 10.1016/j.jpsychores.2015.03.009

[18] Kidman, G., & Chang, C. H. (2020). What does "crisis" education look like?. *International Research in Geographical and Environmental Education*, *29*(2), 107-111. https://doi.org/10.1080/10382046.2020.1730095

[19] Killgore, W. D. S., Cloonan, S. A., Taylor, E. C., & Dailey, N. S. (2020). Loneliness: A signature mental health concern in the era of COVID-19. Psychiatry Research, 290, 113117. https://doi.org/10.1016/j.psychres.2020.113117

[20] Lotka, A. J. (1926). The frequency distribution of scientific productivity. *Journal of the Washington Academy of Sciences*, *16*(12), 317-323.

[21] Matlick, D. (2019). *Stroke Rehabilitation: Therapeutic Exercise*. EBSCO Publishing.

[22] Melguizo-Ibáñez, E., Zurita-Ortega, F., Ubago-Jiménez, J. L., López-Gutiérrez, C. J., & González-Valero, G. (2022). An explanatory model of the relationships between sport motivation, anxiety and physical and social self-concept in educational sciences students. *Current Psychology*, 1-11. https://doi.org/10.1007/s12144-022-02778-9

[23] Öhman, H., Savikko, N., Strandberg, T. E., Pitkälä, K. H., & Kautiainen, H. (2020). Leisure-time physical activity and the risk of incident dementia: a systematic review and meta-analysis of prospective cohort studies. Journal of the American Medical Directors Association, 21(2), 170-177. doi: 10.1016/j.jamda.2019.07.010

[24] Pereira, C. V. T., Cuberos, R. C., & Zagalaz, J. C. (2023). Distance education in bolivia: analysis of its evolution, current situation and proposal for improvement. *Journal of Positive Psychology and Wellbeing*, 360–384.

[25] Ramirez-Granizo, I. A., Sánchez-Zafra, M., Zurita-Ortega, F., Puertas-Molero, P.,

González-Valero, G., & Ubago-Jiménez, J. L. (2020). Multidimensional self-concept depending on levels of resilience and the motivational climate directed towards sport in schoolchildren. *International journal of environmental research and public health, 17*(2), 534. https://doi.org/10.3390/ijerph17020534

[26] Rogerson, M., Barton, J., Bragg, R., & Pretty, J. (2021). Green exercise and mindfulness: Synergies to enhance mental wellbeing. Current Opinion in Psychology, 41, 54-59. doi: 10.1016/j.copsyc.2021.04.015

[27] Smith, A. (2020). Introduction to Special Issue on Mental Health and Mental Illness in Physical Education and Youth Sport. *European Physical Education Review, 26*(3), 609–621. https://doi.org/10.1177/1356336X20947554

[28] Torales, J., Almiron, M., Gonzalez, I., Gomez, N., Ortiz, R. y Ibarra, V. (2018). Ejercicio físico como tratamiento adyuvante de los trastornos mentales. *Una revisión narrativa*. FCM-UNA. (51) 27-32. https://doi.org/2018.051(03)27-032

[29] Van Eck, N. J., & Waltman, L. (2010). Software survey: VOSviewer, a computer program for bibliometric mapping. *Scientometrics*, *84*(2), 523–538, https://doi.org/10.1007/s11192-009-0146-3

[30] Wang, X., Tan, L., Wang, X., Liu, W., Lu, Y., Cheng, L., & Sun, Z. (2020). Comparison of nasopharyngeal and oropharyngeal swabs for SARS-CoV-2 detection in 353 patients received tests with both specimens simultaneously. *International Journal of Infectious Diseases*, *94*, 107-109. https://doi.org/10.1016/j.ijid.2020.04.023

[31] White, M. P., Alcock, I., Grellier, J., Wheeler, B. W., Hartig, T., Warber, S. L., Bone, A., Depledge, M. H., & Fleming, L. E. (2020). Spending at least 120 minutes a week in nature is associated with good health and wellbeing. Scientific Reports, 10(1), 16899. doi: 10.1038/s41598-020-73992-8