





## RESEARCH ARTICLE

# Happiness and satisfaction research pre and during the COVID-19 pandemic: a bibliometric analysis of global scientific literature [version 1; peer review: awaiting peer review]

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**V1** First published: 13 Jun 2023, 12:658  
<https://doi.org/10.12688/f1000research.131212.1>  
Latest published: 13 Jun 2023, 12:658  
<https://doi.org/10.12688/f1000research.131212.1>

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## Abstract

**Background:** The study provides a comprehensive analysis of trends of global scientific research, comparing pre-coronavirus disease (COVID 19) and during COVID-19 research in happiness and satisfaction, from 2014 up to 2021.

**Methods:** The study period of the current research was divided into two phases, before the COVID-19 pandemic (1998 documents) and during COVID-19 (2020 until December 18, 2021). The Scopus database was comprehensively searched on relevant publications on Happiness and Satisfaction. Only articles published in English were retrieved. Bibliometric indicators were analyzed using Bibliometrix, an R package, and VOSviewer. Var1.6.6. Bibliometric indicators include the year of publications, authors, region, subject areas, countries, institutions, journals, country collaboration. Authorship productivity was presented in the final analysis.

**Results:** A total of 3069 documents were extracted from Scopus. Overall, articles retrieved were written by 5220 authors before COVID-19 (2014-2019) and 3520 authors during COVID-19 (2020-2022), published in 2593 journals, with 83 countries represented before COVID-19 and 84 during COVID-19, and 21.66 average citations per document before COVID-19 and 30.4 average citations per document during COVID-19. Journal of Happiness Studies led in the number of articles produced. University of California was the most productive institution both before (number of publications [NP] = 42) and during (NP = 19) the COVID-19 pandemic. The US was the most productive country on multiple metrics; firstly, based on the most productive country both before (NP = 341) and during the pandemic (NP = 145), and secondly, based on the multiple country publications metric both

## Open Peer Review

**Approval Status** Awaiting Peer Review

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before (NP = 34) and during the pandemic (NP = 34).

**Conclusions:** This bibliometric study demonstrates that the COVID-19 pandemic has not significantly affected the productivity of happiness and satisfaction researchers; however, there are subtle changes in thematic evolution that will probably inform the direction of happiness research in the coming decade.

### Keywords

happiness, satisfaction, COVID-19, bibliometrics analysis, publications



This article is included in the [Research on Research, Policy & Culture gateway](#).

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**Author roles:** **Pang NTP:** Conceptualization, Data Curation, Project Administration, Resources, Supervision, Writing – Original Draft Preparation; **Kamu A:** Conceptualization, Data Curation, Formal Analysis, Investigation, Methodology, Resources, Software, Validation, Visualization, Writing – Original Draft Preparation; **Guan TE:** Writing – Review & Editing; **Sombuling A:** Writing – Review & Editing; **Ho CM:** Writing – Review & Editing; **Mohamad NH:** Writing – Review & Editing; **Wider W:** Writing – Review & Editing; **Fauzi MA:** Methodology, Writing – Review & Editing

**Competing interests:** No competing interests were disclosed.

**Grant information:** The author(s) declared that no grants were involved in supporting this work.

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**How to cite this article:** Pang NTP, Kamu A, Guan TE *et al.* **Happiness and satisfaction research pre and during the COVID-19 pandemic: a bibliometric analysis of global scientific literature [version 1; peer review: awaiting peer review]** F1000Research 2023, 12:658 <https://doi.org/10.12688/f1000research.131212.1>

**First published:** 13 Jun 2023, 12:658 <https://doi.org/10.12688/f1000research.131212.1>

## Introduction

Happiness and satisfaction are increasingly influencing a growing movement of quality-of-life studies, and are no longer a single metric, or overly tied to infrastructural development. Rather, they are more holistic, biopsychosocial constructs that look into quality of life, satisfaction, psychological wellness, and salient features of the landscape, of city design, and of spaces in which people interact at work and play. However, the coronavirus disease (COVID-19) pandemic has potentially resulted in shifts among the general population in terms of how happiness and satisfaction are perceived (O'Donnell, Wilson, Bosch, & Borrows, 2020). Such a change is multifactorial and does not merely result from the physical infection and the fear that ensues. More structurally, there have been ripple effects from the psychological consequences of multiple lockdowns, movement restrictions, and quarantine orders imposed across varying degrees in various parts of the world. These have resulted in stagnant or declining economic growth and high levels of opportunities lost, inevitably increasing unemployment rates globally (Mele & Magazzino, 2021). Employment aside, such measures have resulted in high levels of isolation, reduced social interaction with family and friends, and detachment from society, which have been demonstrated to have a detrimental effect on the population. This is especially so in two crucial sectors – the young, for whom the inalienable right to receiving a quality universal education has been impaired by online schooling and connectivity issues; and the elderly, who become increasingly isolated by COVID-19 lockdowns and have more physical susceptibility to the adverse consequences of the pandemic per se.

Hence, it is crucial that we quantify and collate the research work performed by institutions around the world during the COVID-19 pandemic that focus on effect of COVID-19 lockdowns on happiness and satisfaction, as evidence-based policies are crucial to provide scientifically sound recommendations that inform governmental policies on this issue. This is even more so as economies and countries gradually open up. As countries transform post-pandemic and continue creating spaces for individuals in cities to work, play, and conduct their business, it is crucial that we can keep our pulse on trends in quality of life, urban design, connectedness, happiness, and psychological wellbeing. Individual studies, though with good reliability and validity, are less generalizable; hence bibliometric analysis has emerged as a new tool to perform big picture analysis on the evidence at large.

Bibliometric analysis is crucial as a new analytical technique to map existing literature that revolves around a particular theme of research, and can be important in assessing trends (Deng, Wang, Chen, & Wang, 2020; Dervis, 2019; Kawuki, Yu, & Musa, 2020b; Kutluk & Danis, 2021; Musa, El-Sharief, Musa, Musa, & Akintunde, 2021; Odone *et al.*, 2020; Sun & Yuan, 2020). It identifies suitable research hotspots based on historical trends which can encompass diverse domains both quantitatively and qualitatively. Also, bibliometric analysis can assist with research retrospection (Falagas, Karavasiou, & Bliziotis, 2006; Zhang *et al.*, 2021), allowing analysis, visualization and evaluation of scientific research teams. Hence, connections can be established more clearly between authors, frameworks, methodologies, and translational practice. (Song *et al.*, 2019). Moreover, research trends, topics, and relative importance on publication in particular areas can be ascertained (Ellegaard & Wallin, 2015; Herrera-Viedma *et al.*, 2020). Bibliometric tools have assisted greatly in looking at research trends in various fields across the spectrum including Ebola (Kawuki, Yu, & Musa, 2020b; Yi, Yang, & Sheng, 2016), timeframe-specific COVID-19 research (Furstenau *et al.*, 2021; Lou *et al.*, 2020), malaria (Fu *et al.*, 2015), and childhood obesity (Kawuki *et al.*, 2020a). As the pandemic has shifted global priorities drastically, however, there has been no bibliometric research that examines trends before and after, and does a suitable comparison.

Thus, this analysis's specific objectives include identifying the scientific research growth, publication, and citation trends across time for COVID-19 affecting happiness and satisfaction. This study looks at these bibliometric parameters pre- and during COVID-19 to identify if there have been disruptions in research output or shifts in research priorities given the cataclysmic changes the world has experienced (Zambrano, Alvarez, & Caballero, 2021). Hence, this bibliometric analysis aims to shine the spotlight on the most active authors, journals, the highest-contributing countries and institutions, and the most proactive funding organizations involved in the field of happiness and satisfaction. Word-cloud and conceptual structure map methods allow more illustrative depictions of the research corpus of happiness and satisfaction research both prior to and in the light of the COVID-19 pandemic, allowing us to make comparisons and contrasts parsimoniously.

## Methods

### Study design

The study adopted the bibliometric method to quantitatively and qualitatively analyze documents indexed in the Scopus database. The study period of the current research was divided into two phases, before the COVID-19 pandemic (covering 1998 documents) and during COVID-19 (2020 until December 18, 2021).

### Search strategy

On December 18, 2021, the Scopus database was comprehensively searched for relevant publications on happiness and satisfaction (search query used: TITLE-ABS-KEY "happiness" AND "satisfaction"). Only articles published in English

were retrieved. A total of 3069 documents were extracted from Scopus. Bibliometric indicators include the year of publications, authors, region, subject areas, countries, institutions, journals, country collaboration. Authorship productivity was presented in the final analysis.

### Data analysis

The metadata on the effects of the COVID-19 Pandemic on happiness and satisfaction was exported from Scopus. Bibliometrix, with an R package was used to perform comprehensive science mapping analysis (Aria & Cuccurullo, 2017) and VOSviewer.Var1.6.6 was used to developed bibliometric maps between documents to examine their characteristics (Van Eck & Waltman, 2010).

## Results

### The basic characteristics of the COVID-19 pandemic on happiness and satisfaction documents

The data search result included 1998 articles before COVID-19 and 1071 during COVID-19, with 21.66 and 30.4 average citations per document, respectively. The types of documents included were 2593 articles (84.50%) and 129 conference papers (4.20%), among others (refer to Table 1).

**Table 1. General characteristics on the effects of the coronavirus disease (COVID-19) pandemic on happiness and satisfaction, before COVID-19 (2014-2019) and during COVID-19 (2020-December 18, 2021).**

Description	Before COVID-19 (2014-2019)	During COVID-19 (2020-2022)
Main Information About Data		
Timespan	2014-2019	2020-2022
Sources (Journals, Books, etc.)	1139	643
Documents	1998	1071
Average Years from Publication	5	1.47
Average Citations Per Documents	21.66	30.4
Average Citations Per Year Per Doc	4.278	12.05
References	87958	54852
Document Types		
Article	1662	931
Article In Press	1	0
Book	13	1
Book Chapter	97	22
Conference Paper	86	43
Conference Review	2	0
Data Paper	1	0
Editorial	14	9
Erratum	3	2
Letter	13	3
Note	30	7
Review	73	51
Short Survey	3	2
Document Contents		
Keywords Plus (Id)	4716	2987
Author's Keywords (De)	4203	2869
Authors		
Authors	5220	3520
Author Appearances	6140	3987
Authors Of Single-Authored Documents	375	154
Authors Of Multi-Authored Documents	4845	3366

**Table 1.** *Continued*

Description	Before COVID-19 (2014-2019)	During COVID-19 (2020-2022)
Authors Collaboration		
Single-Authored Documents	433	173
Documents Per Author	0.383	0.304
Authors Per Document	2.61	3.29
Co-Authors Per Documents	3.07	3.72
Collaboration Index	3.1	3.75

**Performance analysis**

The annual scientific production included the number of articles before the COVID-19 period (year 2019) 449 (14.63%) and during the COVID-19 period (year 2021) 541 (17.63%) (refer to [Table 2](#)).

There was a range of 2.06-16.01 mean total citations per year (2015-2019) before the COVID-19 period (21.06%) and 39.06 mean total citations per year in 2020 during the COVID-19 period (refer to [Table 3](#)).

**Table 2. Annual scientific production.**

Year	Articles
2014	85
2015	331
2016	386
2017	346
2018	401
2019	449
2020*	519
2021*	541
2022*	11

\*During the COVID-19 pandemic

**Table 3. Average citations per year.**

Year	N	MeanTCperArt	MeanTCperYear	CitableYears
2014	85	0	0	7
2015	331	12.41087613	2.068479355	6
2016	386	11.03108808	2.206217617	5
2017	346	23.91618497	5.979046243	4
2018	401	30.56109726	10.18703242	3
2019	449	32.02895323	16.01447661	2
2020*	519	39.05587669	19.52793834	2
2021*	541	22.69500924	22.69500924	1
2022*	11	0.545454545		0

MeanTCperArt = the mean total citations per article or the average number of citations per paper.

MeanTCperYear = the mean total citations per year or the average number of citations per year.

\*During the COVID-19 pandemic.

The source local impact was computed by the H index before the COVID-19 pandemic (refer to Figure 1). Advances in Intelligent Systems and Computing had a h-index of 7, followed by a h-index of 5 in Lecture Notes in Computer Science, and h=4 in ACM International Conference Proceeding Series.

The source local impact was computed by H index for the period during the COVID-19 pandemic (refer to Figure 2). The h-index was 4 for Proceedings of the International Conference on Industrial Engineering and Operations Management, followed by 3 in Pervasive Health, whereby the others ranged between 1 and 2.

Science mapping

A total of 1,139 sources contributed to happiness and satisfaction research before the COVID-19 period. The topmost influential publications are listed in Table 4. Journal of Happiness Studies had 102 articles, followed by Social Indicators Research which had 77 articles.

A total of 643 sources contributed to happiness and satisfaction research during the COVID-19 period. The topmost influential publications are listed in Table 5. Journal of Happiness Studies had 53 articles followed by International Journal of Environmental Research and Public Health with 46 articles.

Table 6 lists the top 10 most influential publications before the COVID-19 pandemic, including their TC per Year and Normalized TC. Table 7 displayed the top ten most influential publications during to the COVID-19 pandemic, including their TC per Year and Normalized TC, as shown in Table 5.

A total of 5220 authors contributed to happiness and satisfaction research before the COVID-19 period. The topmost relevant authors are listed in Table 8. Veenhoven R contributed 15 articles, with 9.92 articles fractionalized, followed by Diener E who contributed 14 articles, with 4.79 articles fractionalized.

A total of 3520 authors contributed to happiness and satisfaction research during COVID-19. The topmost relevant authors are listed in Table 9. Veenhoven R contributed 8 articles, with 3.12 articles fractionalized, followed by Ravina-Ripoll R who contributed 7 articles, with 2.00 articles fractionalized.

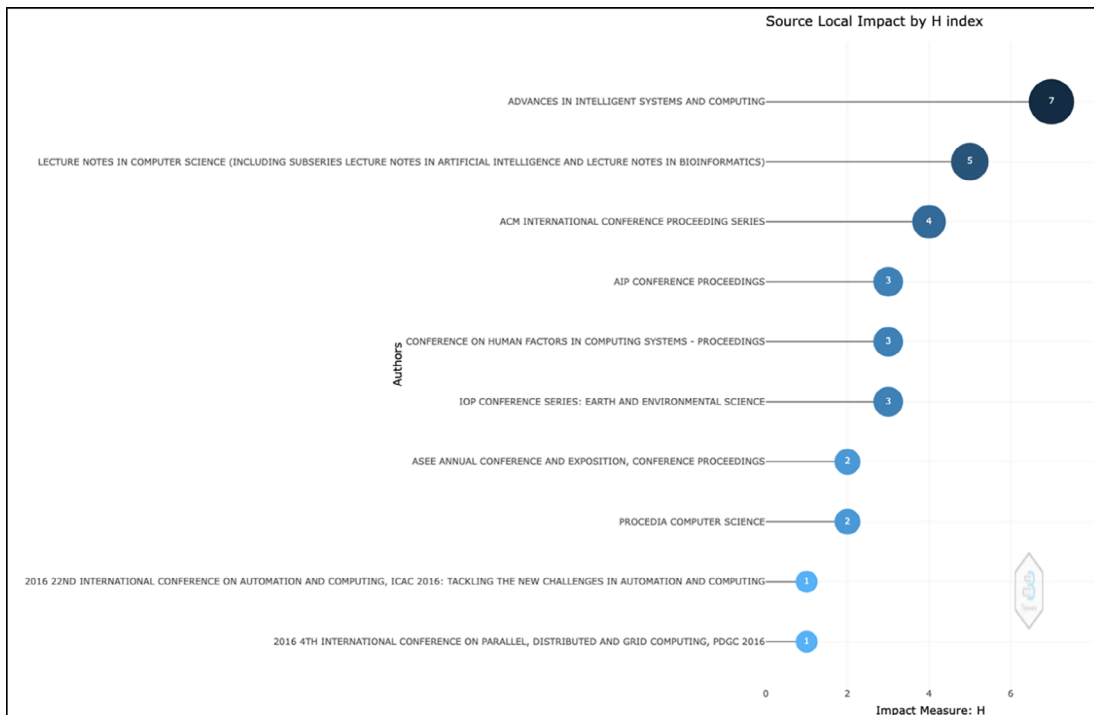
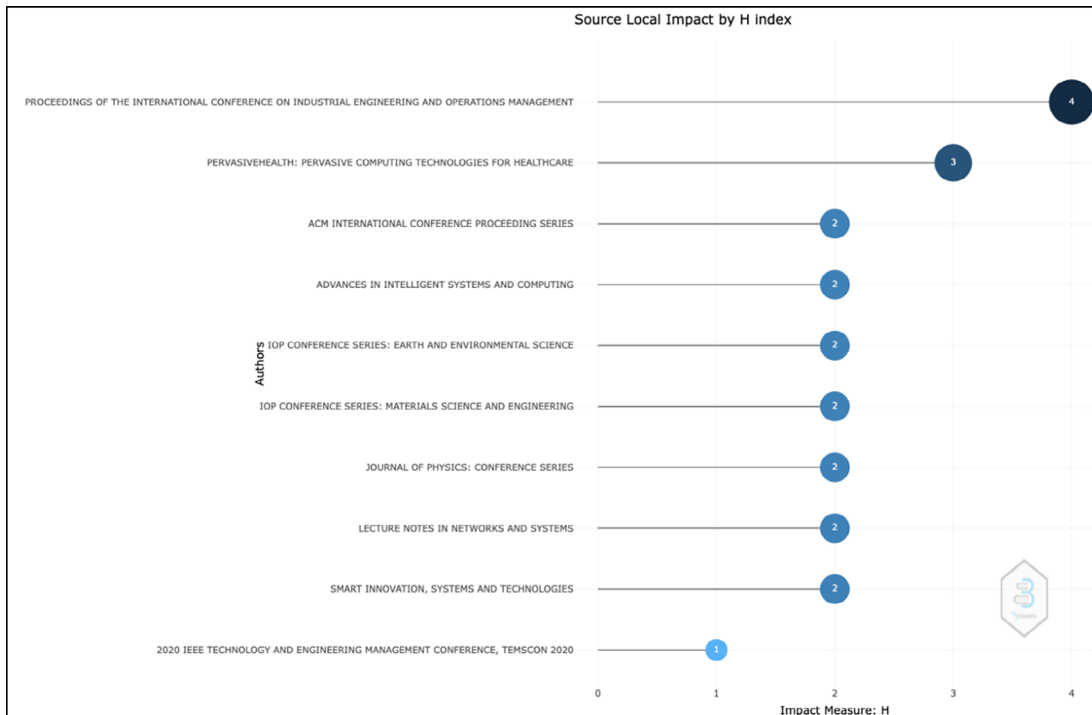


Figure 1. Source impact by H index before the COVID-19 pandemic (2014-2019).



**Figure 2. Source impact by H index during the COVID-19 pandemic (2020-2022).**

**Table 4. Top 10 most influential publications before the COVID-19 pandemic.**

Sources	Articles
Journal Of Happiness Studies	102
Social Indicators Research	77
Applied Research in Quality of Life	24
Frontiers In Psychology	21
Personality And Individual Differences	21
PLOS One	19
Journal Of Positive Psychology	17
International Journal of Environmental Research and Public Health	15
Aging And Mental Health	11
Social Science and Medicine	11

**Table 5. Top 10 most influential publications during the COVID-19 pandemic.**

Sources	Articles
Journal Of Happiness Studies	53
International Journal of Environmental Research and Public Health	46
Frontiers In Psychology	28
Applied Research in Quality of Life	22
Current Psychology	22
Sustainability (Switzerland)	21
Journal Of Positive Psychology	15
Social Indicators Research	15
PLOS One	10
Monitoring Obshchestvennogo Mneniya: Ekonomicheskije I Sotsial'nye Peremeny	7

**Table 6. Top 10 most cited publications before the COVID-19 pandemic.**

Paper	DOI	Total Citations	TC per Year	Normalized TC
Fobelov D, 2019, Aip Conf Proc	10.1063/1.5137988	2019	403.80	63.04
Sultana S, 2019, Conf Hum Fact Comput Syst Proc	10.1145/3290605.3300586	2019	403.80	63.04
Al Halyan A, 2019, Soc Pet Eng - Abu Dhabi Int Pet Exhib Conf, Adip	10.2118/197532-ms	2019	403.80	63.04
Cerd Surez Lm, 2019, Cisci - Decima Octava Conf Iberoam Sist, Cibern Inform, Decimo Sexto Simp Iberoam Educ, Cibern Inform - Mem	NA	2019	403.80	63.04
Li T, 2019, Iccrem: Innov Constr Proj Manag Constr Ind - Proc Int Conf Constr Real Estate Manag	10.1061/9780784482308.095	2019	403.80	63.04
Dilshad N, 2019, Int Conf Signal Process Inf Secur, Icpisp	10.1109/CSPIS.2018.8642717	2018	403.60	63.01
Chen S, 2018, Lect Notes Comput Sci	10.1007/978-3-030-03649-2_3	2018	336.33	66.03
Balcita Re, 2018, Proc Int Workshop Comput Sci Eng, Wcse	NA	2018	336.33	66.03
Eretin, 2019, Springer Proc Complex	10.1007/978-3-319-89875-9_25	2017	403.40	62.97
Arizal N, 2018, Iop Conf Ser Earth Environ Sci	10.1088/1755-1315/175/1/012099	2017	336.17	66.00

**Table 7. Top 10 most cited publications during the COVID-19 pandemic.**

Paper	DOI	Total Citations	TC per Year	Normalized TC
Yadav J, 2021, Iop Conf Ser Earth Environ Sci	10.1088/1755-1315/796/1/012032	2021	2021	89.0504
Afriansyah Y, 2021, Proc - Ieee Int Conf Ind 4 0, Artif Intell, Commun Technol, Iaict	10.1109/IAICT52856.2021.9532535	2021	2021	89.0504
Zhan X, 2021, Lect Notes Networks Syst	10.1007/978-3-030-80285-1_38	2021	2021	89.0504
Ari Ird, 2021, Iop Conf Ser Earth Environ Sci	10.1088/1755-1315/799/1/012019	2020	2020	89.0064
Amaro S, 2021, Smart Innov Syst Technol	10.1007/978-981-33-4256-9_44	2020	2020	89.0064
Singh S, 2020, Aip Conf Proc	10.1063/5.0032640	2020	1010	51.7208
Sohrab F, 2020, Ubicomp/Iswc Adjunct - Proc Acm Int Jt Conf Pervasive Ubiquitous Comput Proc Acm Int Symp Wearable Comput	10.1145/3410530.3414443	2020	1010	51.7208
Zhengqiang Z, 2020, E3s Web Conf	10.1051/e3sconf/202017902026	2020	1010	51.7208
Ravina-Ripoll R, 2020, Ieee Technol Eng Manag Conf, Temscon	10.1109/TEMSCON47658.2020.9140146	2020	1010	51.7208
Yang H, 2020, Proc - Int Conf E-Commerce Internet Technol, Ecit	10.1109/ECIT50008.2020.00035	2020	1010	51.7208



**Table 8. Top 10 most relevant authors before the COVID-19 pandemic.**

Authors	Articles	Articles Fractionalized
Veenhoven R	15	9.92
Diener E	14	4.79
Oishi S	14	4.55
Okulicz-Kozaryn A	11	6.17
Na Na	10	10.00
Holder Md	8	3.75
Tay L	8	2.46
Abdel-Khalek Am	7	4.50
Kim J	7	1.97
Lyubomirsky S	7	2.12

**Table 9. Top 10 most relevant authors during the COVID-19 pandemic.**

Authors	Articles	Articles Fractionalized
Veenhoven R	8	3.12
Ravina-Ripoll R	7	2.00
Vanderweele TJ	7	1.31
Fukuda S	6	6.00
Fuller-Thomson E	6	1.95
Harolds JA	6	6.00
Krys K	6	0.84
Lyubomirsky S	6	1.39
Okulicz-Kozaryn A	6	2.83
Zhang H	6	3.12

University of California was the most relevant affiliation before the COVID-19 pandemic (number of publications [NP] = 42), followed by University of Michigan (NP = 32) and Erasmus University Rotterdam (NP = 26) (refer to [Figure 3](#)).

University of California was the most relevant affiliation during the COVID-19 pandemic (NP = 19), followed by University of Toronto (NP = 18) and both University of Pennsylvania and Zhejiang University (NP = 14) (refer to [Figure 4](#)).

The USA was the most productive country (NP = 341), followed by the United Kingdom (NP = 119), China (NP = 79), and Korea (NP = 73) as the most influential countries before the COVID-19 pandemic. Meanwhile, the US was the most productive country based on the multiple country publications metric (NP = 54), followed by the United Kingdom (NP = 47) and Netherlands (NP = 29) (refer to [Table 10](#)).

The USA was the most productive country (NP = 145), followed by China (NP = 81), Spain (NP = 52), and Korea (NP = 47) as the most influential countries during the COVID-19 pandemic. Meanwhile, the US was the most productive country based on the multiple country publications metric (NP = 34), followed by Spain (NP = 21) and China (NP = 19) (refer to [Table 11](#)).

### Network analysis and visualization

Using a multiple correspondence analysis (MCA) pre- and post-COVID 19, as shown in [Figure 5](#), a total of 39 keywords were divided into one color, hence explaining the concept of research effects of pre-COVID-19 on happiness and satisfaction. This contrasts with [Figure 6](#), where 42 keywords were divided into two colors: red, with 23 keywords; and

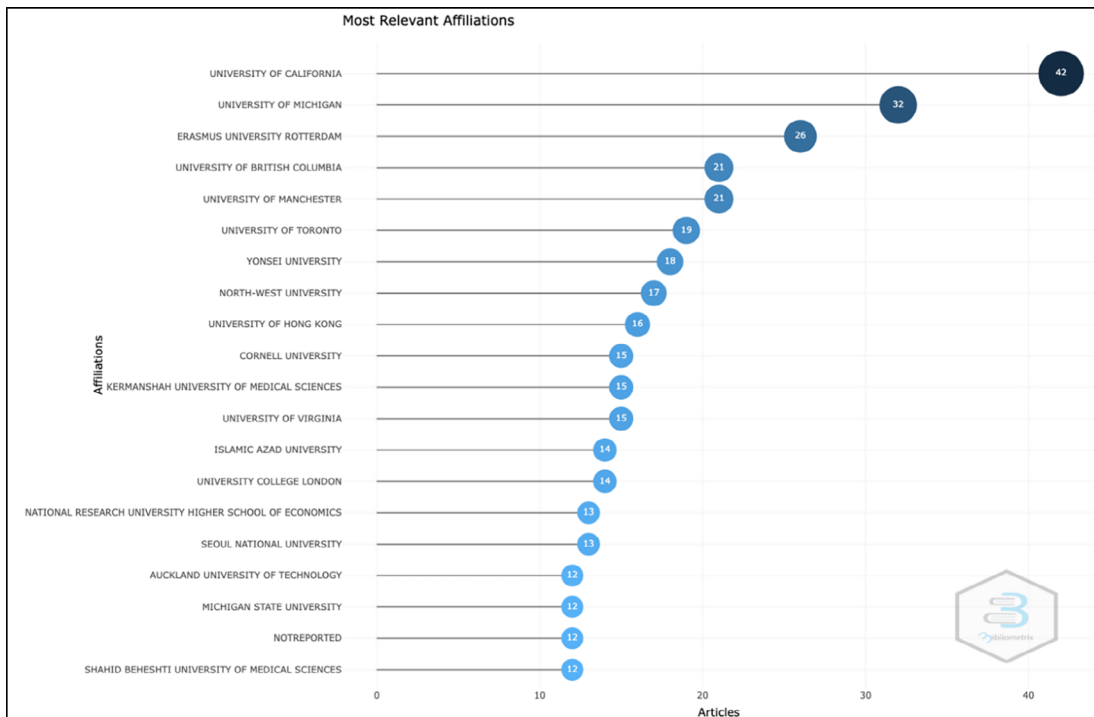


Figure 3. Most relevant affiliations before the COVID-19 pandemic.

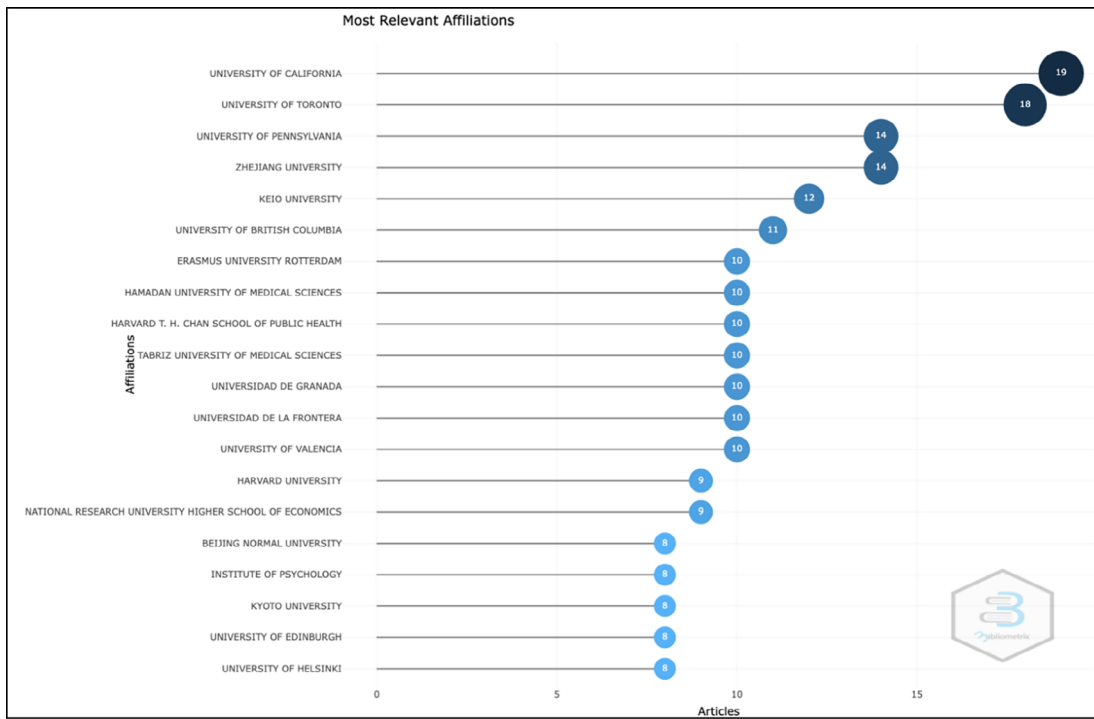


Figure 4. Most relevant affiliations during the COVID-19 pandemic.

**Table 10. Top 10 corresponding author's country before the COVID-19 pandemic.**

Country	Articles	Freq	SCP	MCP	MCP_Ratio
USA	341	0.232289	287	54	0.1584
United Kingdom	119	0.081063	72	47	0.395
China	79	0.053815	56	23	0.2911
Korea	73	0.049728	65	8	0.1096
Spain	67	0.04564	48	19	0.2836
Germany	61	0.041553	44	17	0.2787
Australia	57	0.038828	41	16	0.2807
Canada	57	0.038828	40	17	0.2982
Netherlands	51	0.034741	22	29	0.5686
Iran	46	0.031335	43	3	0.0652

**Table 11. Top 10 corresponding author's country during the COVID-19 pandemic.**

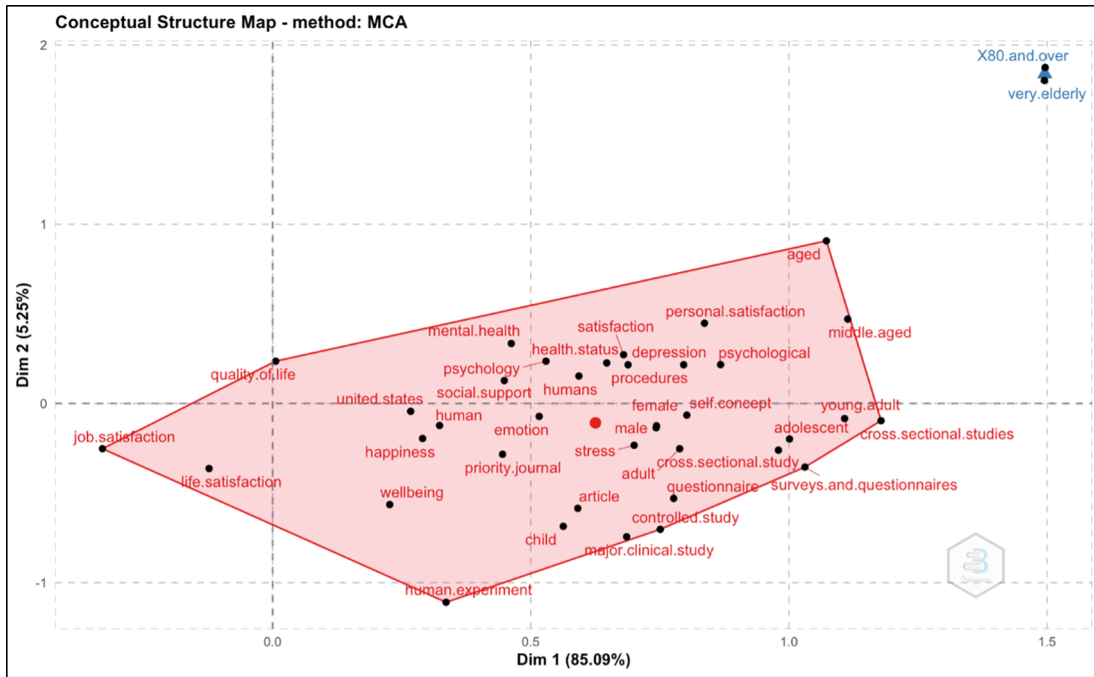
Country	Articles	Freq	SCP	MCP	MCP_Ratio
USA	145	0.1808	111	34	0.2345
China	81	0.101	62	19	0.2346
Spain	52	0.06484	31	21	0.4038
Korea	47	0.0586	38	9	0.1915
United Kingdom	33	0.04115	22	11	0.3333
Turkey	29	0.03616	23	6	0.2069
Canada	28	0.03491	15	13	0.4643
Germany	28	0.03491	18	10	0.3571
Japan	28	0.03491	24	4	0.1429
India	26	0.03242	22	4	0.1538

blue, with 19 keywords. This hence explaining the concept of research effects of during COVID-19 on happiness and satisfaction. Both groups demonstrated different keywords that explain the concept/s of research on happiness and satisfaction pre- and during COVID-19.

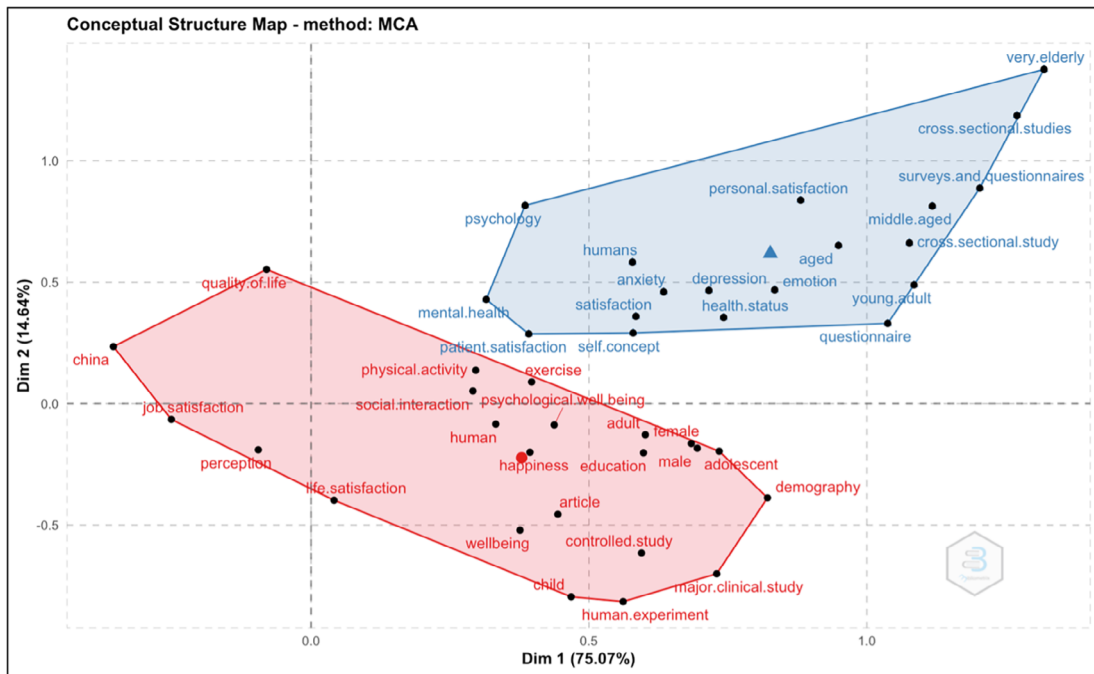
The relation between affiliations, countries, and “keywords plus” occurrence on the effects of the COVID-19 pandemic on happiness and satisfaction are presented in the three fields plot in [Figure 7](#). The keyword visualization is seen in [Figure 7a](#) and [Figure 7b](#), with the word cloud in [Figure 8a](#) and [8b](#). Before the COVID-19 pandemic, “female” is the most frequent keyword with 2430 instances, followed by “male” with 2340, then “happiness” with 2290. During the COVID-19 pandemic, “happiness” is the most frequent keyword with 1230 instances, followed by “female” with 1220, then “male” with 1080.

#### Co-authorship analysis by the unit of countries and author's analysis

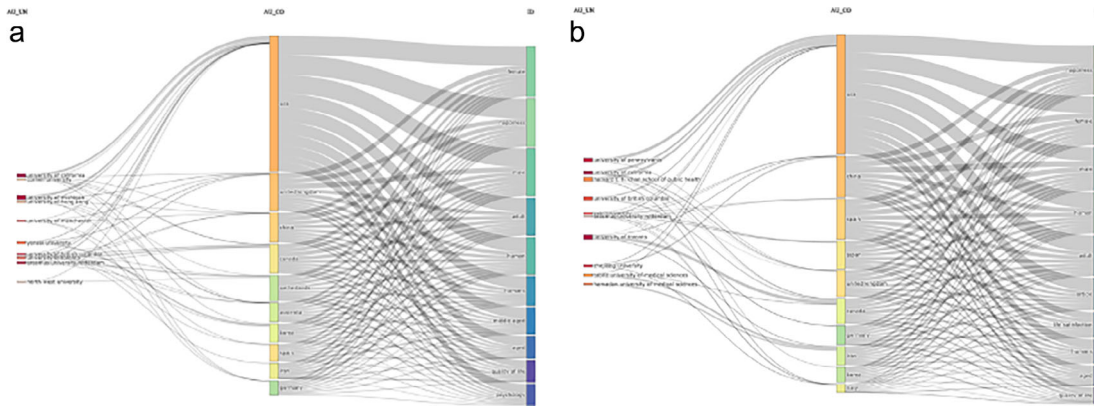
The analysis of social networks between researchers before the COVID-19 pandemic with three or more publications was considered and had 140 authors; only network maps with 11 items are shown in four clusters with links (links = 18 and total link strength = 42) as shown in [Figure 9\(a\)](#). [Figure 9\(b\)](#) demonstrates collaborative ties among countries during the COVID-19 pandemic and mental health research. Authors who published at least three articles in the dataset (n = 61) were included. Overall collaboration is presented in nine different clusters with distinct colors, and the thickness of the line between two countries that contributed to happiness and satisfaction research represents the strength of research collaboration. The distance between the two countries reflects how much the two countries are closely related to the research field. For example, the top three countries were the USA (links = 52 and total link strength = 300), followed by United Kingdom (links = 42, total link strength = 171) and Australia (links = 33 and total link strength = 114). [Figure 9\(c\)](#) showcased which organizations were related, and 26 organizations that meet the thresholds presented in 2 cluster with links (links = 4 and total link strength = 10).



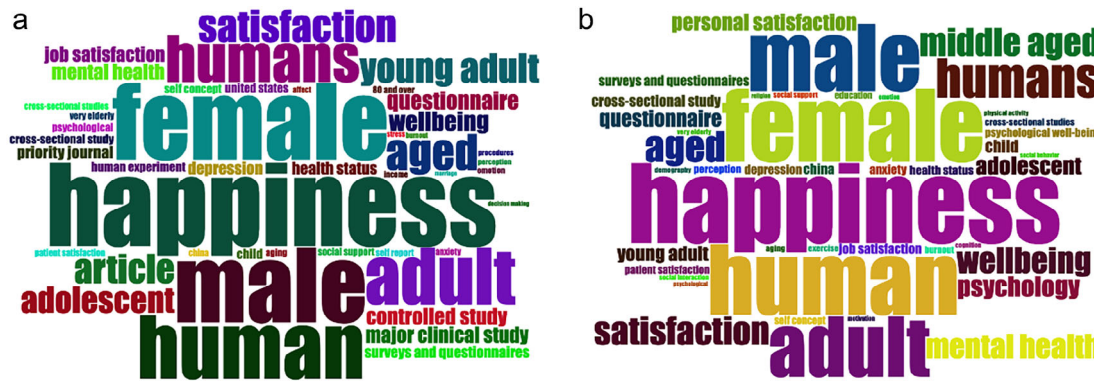
**Figure 5.** Conceptual structure map using multiple correspondence analysis (MCA) before the COVID-19 pandemic.



**Figure 6.** Conceptual structure map using multiple correspondence analysis (MCA) during the COVID-19 pandemic.



**Figure 7.** a. Three-Fields Plot of the keywords Plus analysis (Middle field: countries; Left-field: Affiliations; Right-field: Keywords Plus) before the COVID-19 pandemic. b. Three-Fields Plot of the keywords Plus analysis: (Middle field: countries; Left-field: Affiliations; Right-field: Keywords Plus) during the COVID-19 pandemic.

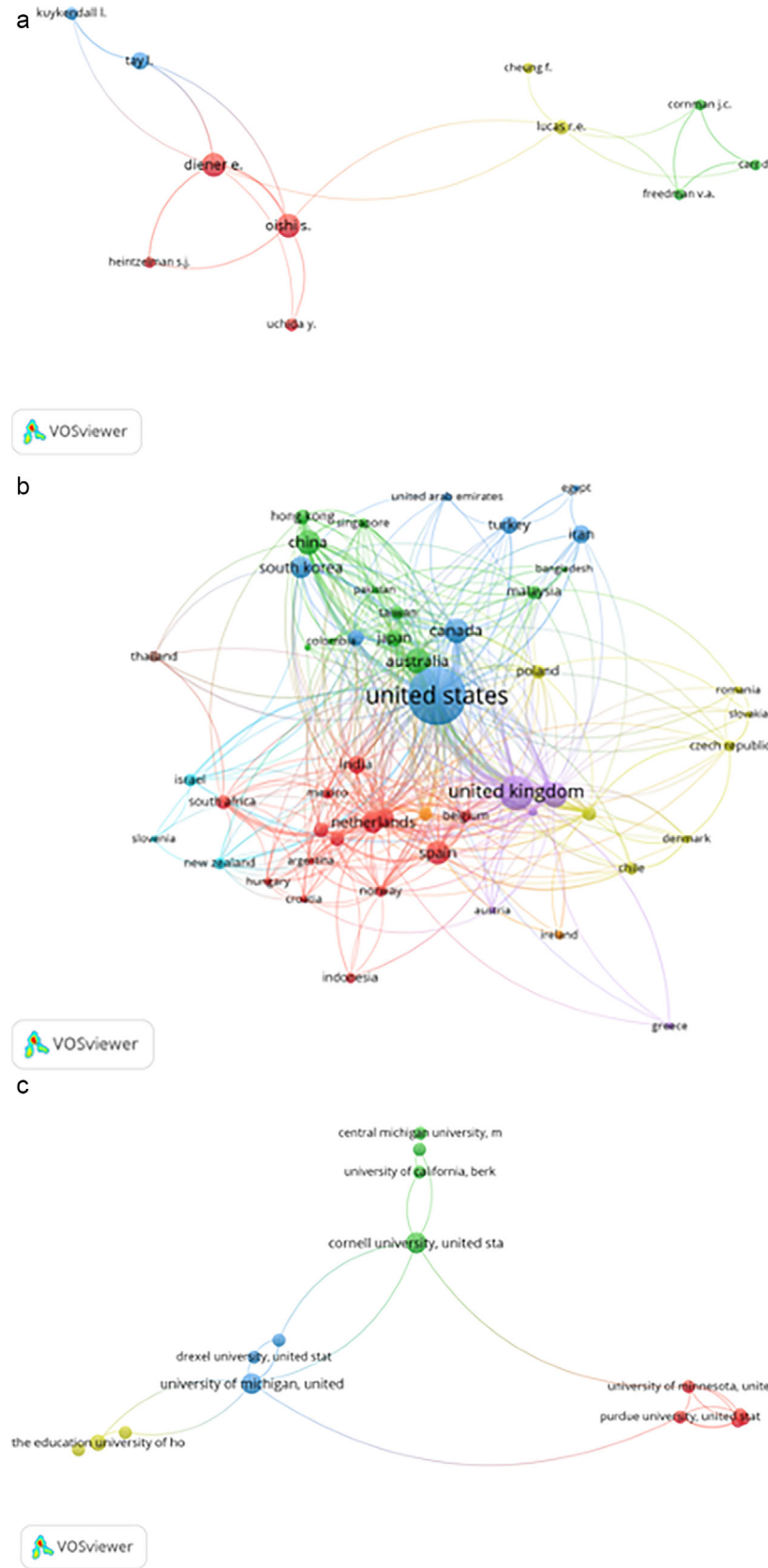


**Figure 8.** a. Keyword occurrences by using Wordcloud visualization of Keywords Plus before the COVID-19 pandemic. b. Keyword occurrences by using Wordcloud visualization of Keywords Plus during the COVID-19 pandemic.

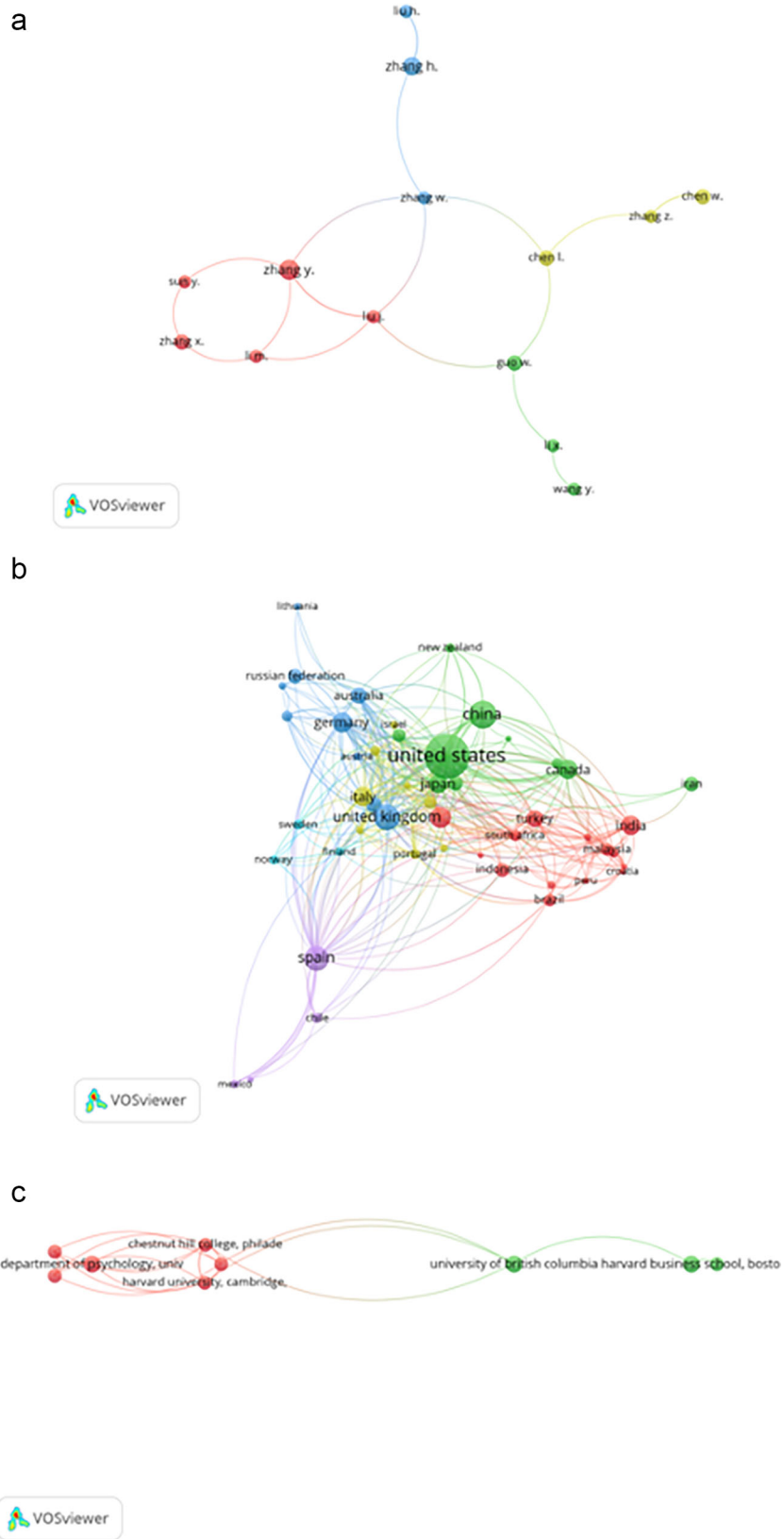
The analysis of social networks between researchers during COVID-19 pandemic with three or more publications was considered and had 68 authors; only network maps with 14 items are shown in 11 clusters with links (links = 17 and total link strength = 20) as shown in Figure 10(a). Figure 10(b) demonstrates collaborative ties among countries during the COVID-19 pandemic and mental health research. Authors who published at least three articles in the dataset (n = 62) were included. Overall collaboration is presented in 37 different clusters with distinct colors, and the thickness of the line between two countries that contributed to happiness and satisfaction research represents the strength of research collaboration. The distance between the two countries reflects how much the two countries are closely related to the research field. For example, the top three countries were the USA (links = 43 and total link strength = 164), followed by Spain (links = 30, total link strength = 81) and Germany (links = 32 and total link strength = 63). Figure 10(c) showcased which organizations were related, and 14 organizations that meet the thresholds presented in one cluster with links (links = 6 and total link strength = 18).

**Trend topic and thematic evolution**

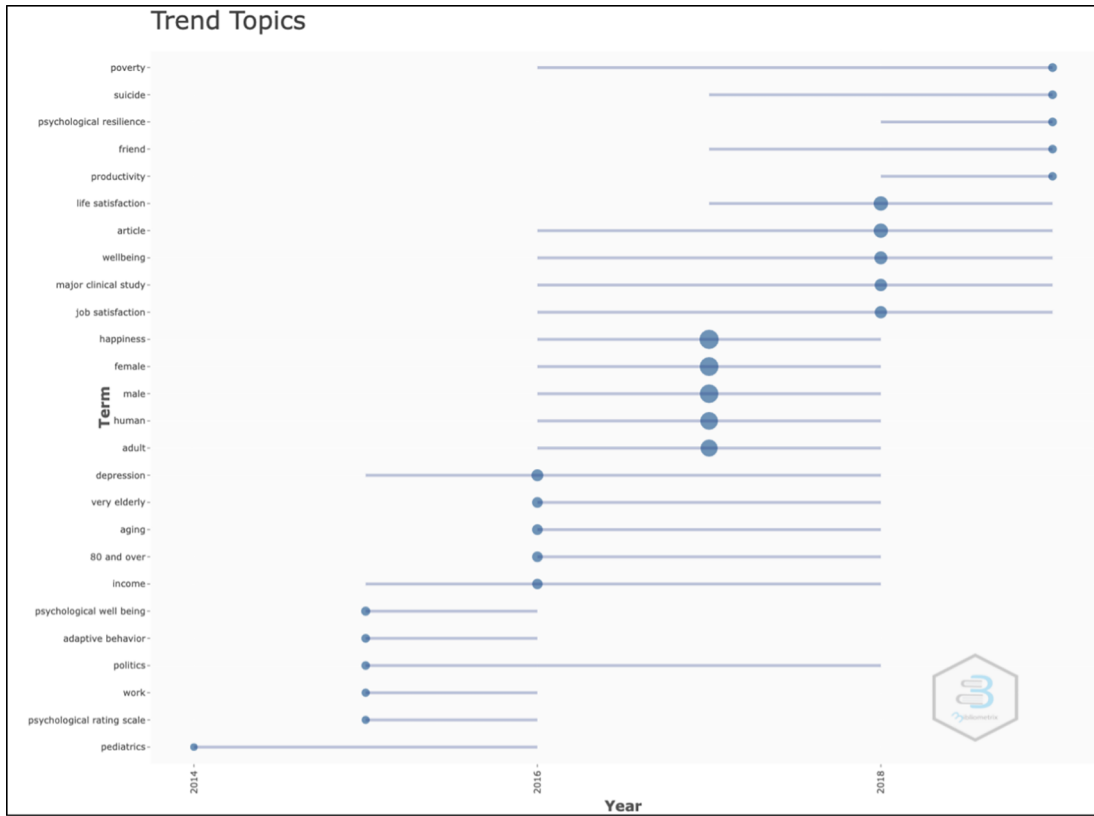
There was a wider range of trend topics pre-COVID 19. Topics ranged across the dimensions, from economic (poverty; productivity) to mental health (suicide; psychological resilience; depression) to general quality of life studies (life satisfaction; happiness; wellbeing); hence no one theme predominated (refer to Figure 11). Post-COVID 19, the topics were more circumscribed, with 2021 topics being relevant to the times (China; patient satisfaction; controlled clinical study) reflecting global anxieties and research priorities (refer to Figure 12). Observing the thematic evolution using author’s keywords pre- and post-COVID 19, some trends emerged out of the literature. Pre-COVID, the themes ranged across the spectrum, from adolescents, social media, to China (refer to Figure 13). Post-COVID-19, the themes coalesced into a few broad keywords, and various themes expanded into separate strands. For instance, the “mental health” keyword evolved into two separate strands of “mental health” and “social support.” The “happiness” keyword evolved into two strands of “subjective well-being” and “happiness” (refer to Figure 14).



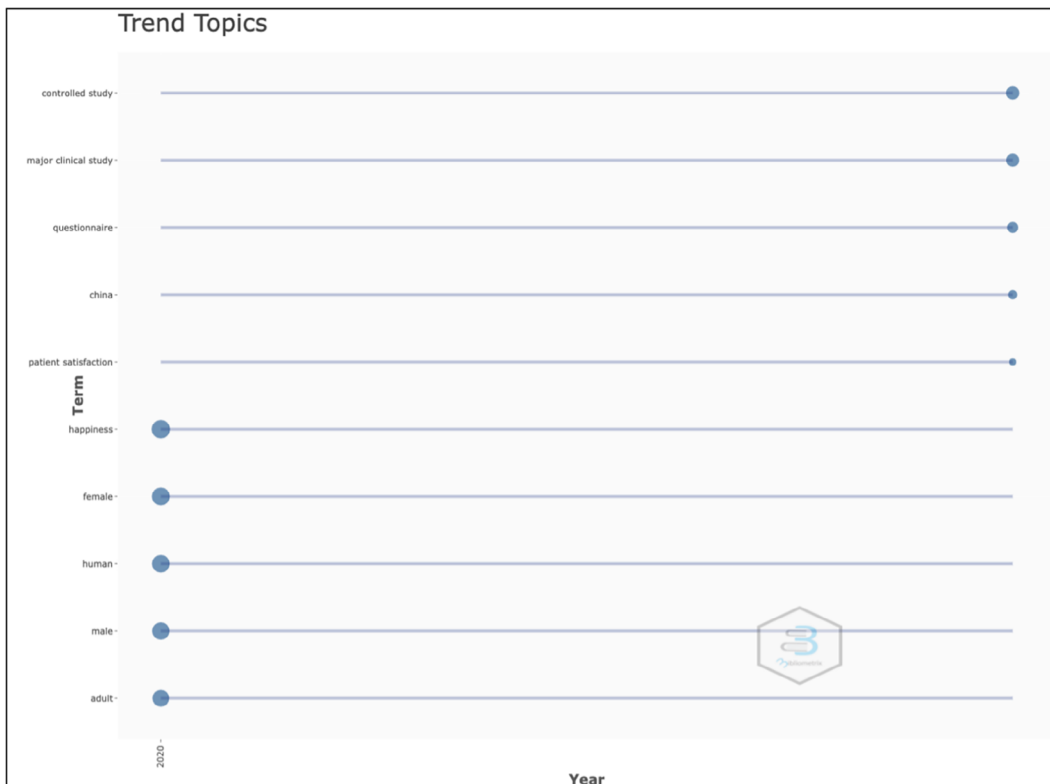
**Figure 9.** a. Collaborative research networks between researchers before the COVID-19 pandemic. b. Collaborative research networks between countries before the COVID-19 pandemic. c. Collaborative research networks between organizations before the COVID-19 pandemic.



**Figure 10.** a. Collaborative research networks between researchers during the COVID-19 pandemic. b. Collaborative research networks between countries during the COVID-19 pandemic. c. Collaborative research networks between organizations during the COVID-19 pandemic.

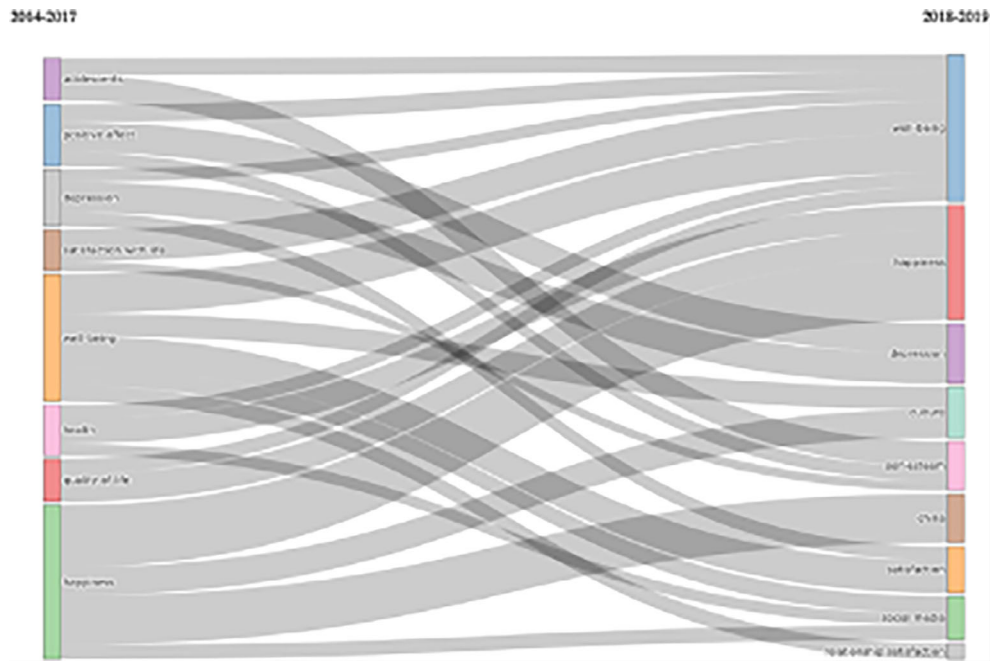


**Figure 11.** Trend topics based on author’s keywords before the COVID-19 pandemic.

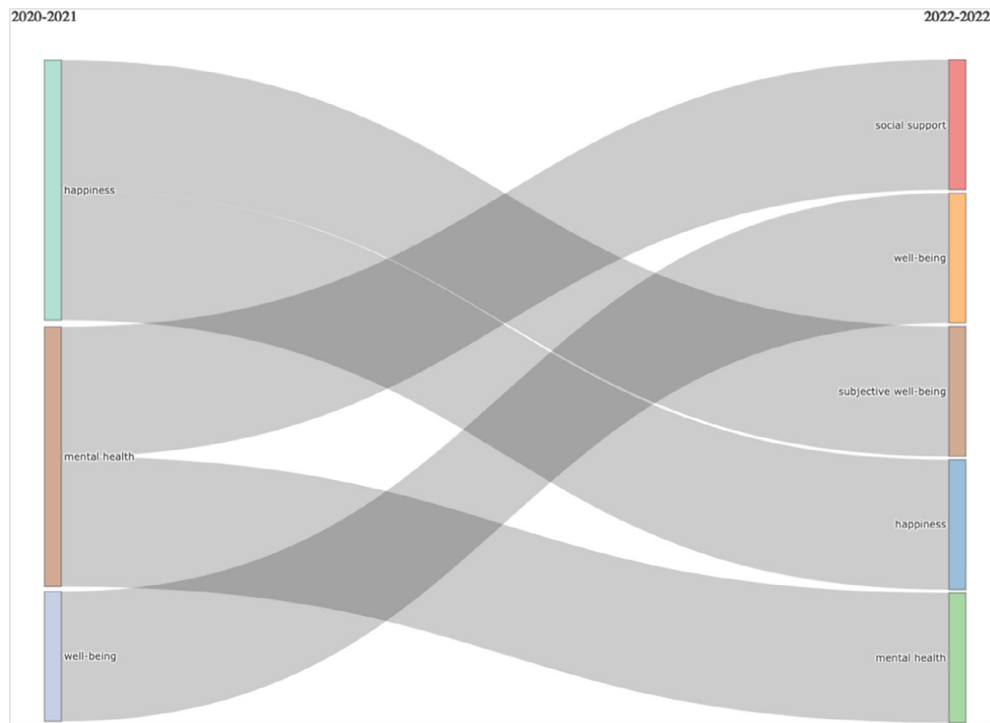


**Figure 12.** Trend topics based on author’s keywords during the COVID-19 pandemic.





**Figure 13.** Thematic evolution using author's keywords before the COVID-19 pandemic.



**Figure 14.** Thematic evolution using author's keywords during the COVID-19 pandemic.

**Discussion**

This study presents a bibliometric overview of the COVID-19 pandemic and publications related to happiness and satisfaction. Overall, the analysis suggests that themes have become more concise and more wellbeing-related in the post-pandemic landscape. It is interesting to note though that the three articles with the highest citation numbers were all related to happiness and satisfaction in an engineering or technical setting, and they were all from 2021. Due to the usual life cycle of research publication in journals, it is most certain that all three articles were submitted pre-COVID, so are more

reflective of the earlier research landscape. The article with the highest impact was a conference series paper focusing primarily on urban quality of life as a response to various urban issues and challenges; however, it was not specific to COVID-19. The article with the second highest level of impact focuses on an elucidation of a human facial expression classification system to test video games using the K-Nearest Neighbor (KNN) classification method and using the Indonesia Mixed Emotion Dataset (IMED) as training data and trial data, incorporating several processes, namely preprocessing, feature extraction, and classification of facial expressions. Again, this research article did not have any correlations with COVID-19 either. The third article with the highest number of citations is a book chapter focusing on psychological impact of design, namely on empirical case studies in city regeneration of post-industrial sites. Notably it is interesting that two of the three top-cited articles focus on the latest evidence in regenerating the urban landscape, despite not being pandemic-specific. Hence, in the new post-COVID urban landscape, it is imperative that cities are replanned and designed smartly to allow for suitable ventilation, physical distancing, increased cyclist, and pedestrian mobility, and higher environmental efficiency and sustainability, as would be suitable in a post-COVID urban landscape.

We can observe too that there are very little differences in author productivity pre- and during COVID-19. The most productive authors were the same ten people pre- and during COVID-19, with roughly similar numbers of articles. This suggests that the during COVID-19 productivity most probably reflects work performed prior to the commencement of the pandemic; hence it will possibly take a few more years for the literature on happiness and satisfaction directly pertaining to the pandemic to be reflected in the bibliometric analysis. Another postulation is that due to this ten authors' primacy in this field, they would still accrue similar numbers of authorship during the pandemic as they would be in advisory or consultancy rather than main authorship roles for papers produced by their happiness or satisfaction research units.

The best place to hence observe a difference is in thematic transformation keywords pre- and during COVID. Pre-COVID, the themes ranged across the spectrum, from adolescents, social media, to China. During COVID-19, the themes coalesced into a few broad keywords. The mental health keyword evolved into two separate strands of mental health and social support.

This suggested that the latter is a key component of preservation of good mental health. The "happiness" keyword evolved into two strands of "subjective well-being" and "happiness," suggesting that in the pandemic, individuals' experiences of happiness and unhappiness were very individualized as different nations and regions were subjected to widely varying levels of lockdown despite having similar epidemiological characteristics. It would be interesting to further perform bibliometric analyses on particular topics within the overall ambit of happiness and see if different trends emerged.

This research is crucial in that it is the first study utilizing novel bibliometric methodologies examining the relationship between both the pre- and during the COVID-19 period regarding happiness and satisfaction. No doubt limitations are inherent in bibliometric methodology; only English publications were able to be extracted in this project, and other databases, such as Google Scholar, PubMed, Web of Science, and Chinese databases were not included. Nevertheless, Scopus nevertheless retains primacy as one of the largest peer reviewed databases extant and is a highly valid primary search source. Also, bibliometric analyses cannot adequately take into account false-positive and false-negative results. Moreover, top-cited articles in this bibliometric analysis were ranked based on the total citation score. No doubt this metric is accepted in publishing and research as a reasonable judge of a paper's impact; however, self-citation may be a mechanism that artificially inflates the overall citation numbers and the h-index.

## Conclusion

This bibliometric study uniquely allows us to observe, with comparisons pre- and during the pandemic, the state of affairs in happiness and satisfaction research across a designated time period, and casts light on the prominent articles, authors, publishing journals, countries, and funding agencies in happiness and satisfaction research. This study demonstrates how themes have evolved over the pandemic, despite the static nature of authors involved, and signals a potential paradigm shift in the priorities of the research community involved in happiness and satisfaction, away from the multifarious foci, towards more focused research addressing the recovery of the world at large from the calamitous economic, social, and psychological consequences of COVID-19. To this end, it is hence crucial that international agencies and research units with expertise or interest in this field offer grants to academicians and researchers who can expedite practical solutions to improve happiness and satisfaction across all strata of society. This bibliometric analysis also underscores the importance of multinational and multiagency collaborations in resolving issues of our times. Despite its precipitous consequences, the sudden shift to universal online working has significantly loosened the barriers to international collaboration, allowing agencies, universities, governments, and individuals to collaborate real-time to share knowledge and expertise in solving the greatest and most pressing issues of our pandemic times, one of which indubitably will be the promotion of higher levels of happiness and satisfaction.

## Data availability

### Underlying data

Zenodo: Happiness and satisfaction research pre and during COVID-19 pandemic: A Bibliometric analysis of global scientific literature. <https://doi.org/10.5281/zenodo.7607045> (Wider, 2023).

This project contains the following underlying data:

- scopus 2020-2022.bib
- scopus before 2020.bib

Data are available under the terms of the [Creative Commons Attribution 4.0 International license](https://creativecommons.org/licenses/by/4.0/) (CC-BY 4.0).

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