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Science Mapping for Popular Topics in Cyberbullying Prevention Articles

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Abstract
An increase in cyberbullying has been shown by various survey results. This condition raises the attention and awareness of global society towards cyberbullying. The awareness of the global community in dealing with cyberbullying generates particular thoughts and programs or anti-cyberbullying movements. In this case, this article aims to analyze the popular topics in the documents related to cyberbullying prevention. The analysis is conducted through science mapping using the *Biblioshiny* for *Bibliometrix* from the *R Tool*. Furthermore, 713 documents are obtained after searched through the keywords: *protection OR prevention OR against AND cyberbullying*, on the Scopus Database on March 17th, 2020. The analysis reveals that 713 documents about cyberbullying prevention are commenced in 2006. The "Computer in Human Behavior" journal is selected as the most relevant source based on the number of documents for this theme. The word 'adolescent', especially female adolescents, is mentioned more in the documents related to cyberbullying prevention. This can indicate that cyberbullying more commonly happens among adolescents, especially female adolescents. Moreover, the topic dendrogram shows that the theme of cyberbullying in social networking is served as a separate theme. Other popular themes are produced at least through 3 approaches, that are survey, experimental (controlled study) and psychological/psychiatric approaches. It is expected that being familiar with the research topics in cyberbullying can contribute a comprehension for related parties towards the developing issues so that cyberbullying prevention programs can be effectively created.

Keywords: science mapping, topics in cyberbullying, cyberbullying prevention, Biblioshiny, R Tool

1. Introduction

Cyberbullying is considered as a crucial problem. Ipsos' Global Advisor study (2018) noted an increase in cyberbullying in 28 countries from 2011 to 2018 by 9%. Ipos (2018) also noted that one in three parents reported cyberbullying towards a

child whom they know in their environment that increased 26% from 2011 (Newall, 2018). Furthermore, the results of a survey of 1500 students previously conducted by i-SAFE (Internet Safety Education) in 2003-2004 shown that 42% of children were bullied while online; 35% of children were threatened while online; 21% of children received malicious messages that threatened through email and other media; 58% of children receive unacceptable words through online media; and 58% of children say something that offends others through online media (I-SAFE, 2009). According to Hinduja & Patchin (2014), involving children in online interactions is one of the causes of increased cyberbullying (Hinduja & Patchin, 2014). Besides, many parties provide their concern regarding this condition that can be seen from the major awareness of the global community towards cyberbullying which reaches 75% (Newall, 2018).

Our previous research also found that students in primary schools had recognized cyberbullying and some of them claimed that they had been bullied on the internet. However, they had attempted to minimize bullying by privately setting their social media accounts (Kurniasih, Kuswarno, Yanto, & Sugiana, 2020).

The awareness of the global community in dealing with cyberbullying generates particular thoughts and programs or anti-cyberbullying movements. Some researchers and writers express their thoughts and research results through scientific work. The results of research should ideally be able to provide certain contributions and solutions both theoretically and practically in solving a problem. In this case, the research topics, especially in the field of cyberbullying, can describe the problems that probably occur in the research site and the solutions should be offered based on the research results.

The intention of this article is mainly to analyze the popular topics in the documents related to cyberbullying prevention. The analysis is conducted through science mapping. It is expected that being familiar with the research topics in cyberbullying can contribute a comprehension for related parties towards the developing issues so that cyberbullying prevention programs can be effectively created.

2. Literature Review

2.1. Science Mapping

Science mapping has been introduced since the 1960s by De Solla Price. Price formulated some structural properties of journal publications, authors, and citations at the time that could be operated in the Garfield's Science Citation Index (Leydesdorff, 1987).

Science mapping is a visualization of various scientific activities, research processes, and scientific progress by employing a computational technique (Chen, Dubin, & Schultz, 2014; Cobo, López-Herrera, Herrera-Viedma, & Herrera, 2011). The main purpose of science mapping is to map the structure and dynamic of science and knowledge (Morris & Van der Veer Martens, 2009; Noyons, Moed, & Van Raan, 1999). Trends in a field of science are monitored through the interaction of the subdomain in the dynamic maps (Noyons et al., 1999). Besides analyzing the publication characteristics through citation and co-citation, it can be also applied

through keyword analysis or called co-word analysis (Noyons, Buter, & Van Raan, 2002).

There is a lot of software that can be used to analyze science mapping (Aria & Cuccurullo, 2017; Cobo et al., 2011; Moral-Muñoz, Herrera-Viedma, Santisteban-Espejo, & Cobo, 2020; Noyons et al., 2002). One of them is to use R programming (Aria & Cuccurullo, 2017; Moral-Muñoz et al., 2020). R is an open-source software that can run almost on all operating systems. One of R's predominance is that it can present better graphs and data visualizations compared to other programming (Peng, 2015).

2.2. Cyberbullying

The researchers explain cyberbullying based on three criteria, that are the intentional offending to the victim, the repeated intimidation and the power imbalance between the bullies and bullied (Van Hee et al., 2018).

According to Hinduja & Patchin (2014), cyberbullying happens when someone repeatedly mocks or sends messages that are disliked by someone through online media. Further, they state that two common things that make cyberbullying difficult to prevent are the unawareness of society towards the harmful effect of cyberbullying and the improper responses of the parents, where many parents consider that children have more skilled in accessing online media than they do (Hinduja & Patchin, 2014). Therefore, cyberbullying requires special attention. All parties must collaborate to develop prevention strategies to overcome this problem (Hinduja & Patchin, 2014; Johnson et al., 2016; Smith, 2016). One of them is to provide media literacy to all communities, ranging from children (Bhat, Chang, & Linscott, 2010; Kurniasih et al., 2020).

3. Research Method

This study uses bibliometric analysis in science mapping. There are at least 7 steps in science mapping, starting from collecting data, data processing, network extraction, normalization, mapping, analysis, and visualization (Cobo et al., 2011). The data sources were obtained through a search result in the Scopus Database on March 17th, 2020. As a result, 713 documents were obtained by using the keywords: *protection OR prevention OR against AND cyberbullying*. The datasheet from the Scopus Database is imported into a format that is correspondence with the R format. Then, the data are processed using the *Biblioshiny* for *Bibliometrix* from the *R package*. In this study, the popular themes related to cyberbullying are analyzed by considering the relevant sources, the frequency of appearing words, the Tree-Map, and the annual trend and dendrogram topics.

4. Results and Discussion

4.1. The Most Relevant Resources for Cyberbullying Prevention Documents

As explained in the Research Methods section, the data source for analyzing the popular topics in the articles related to cyberbullying prevention is taken from the Scopus Database. 713 documents were obtained after investigating through the keywords: *protection OR prevention OR against AND cyberbullying*, on March

17th, 2020. The datasheet from the Scopus Database is imported into a format that is correspondence with the R format. Furthermore, the data is processed using *Biblioshiny*. The general information from the 713 documents can be seen in Table 1.

Table 1. General information regarding the documents obtained from the Scopus Database using the keywords: protection OR prevention OR against AND cyberbullying.

Description	Results
Documents	713
Sources (Journals, Books, etc.)	399
Keywords Plus (ID)	1871
Author's Keywords (DE)	1369
Period	2006 - 2020
Average citations per documents	18,46
Authors	1665
Author Appearances	2280
Authors of single-authored documents	97
Authors of multi-authored documents	1568
Single-authored documents	124
Documents per Author	0,428
Authors per Document	2,34
Co-Authors per Documents	3,2
Collaboration Index	2,66
Document types	
ARTICLE	487
ARTICLE IN PRESS	8
BOOK	22
BOOK CHAPTER	72
CONFERENCE PAPER	54
CONFERENCE REVIEW	6
EDITORIAL	7
ERRATUM	1
LETTER	1
NOTE	3
REVIEW	51
SHORT SURVEY	1

Table 1 shows that 713 documents on cyberbullying prevention are initiated in 2006. These documents are scattered in various sources. Figure 1 shows that the most relevant source based on the number of documents for this theme is the "Computer in Human Behavior" journal.

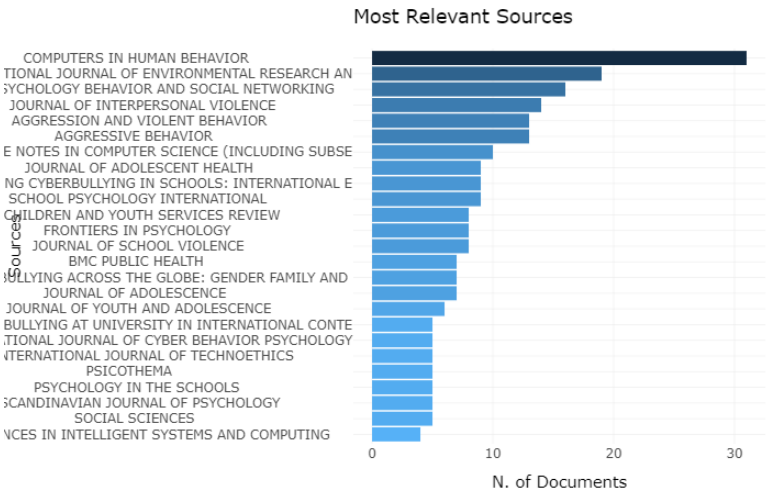

Figure 1. The most relevant sources based on the number of articles

Figure 1 shows the most 25 relevant sources by number. From Figure 1, it can be seen that the three journals that sequentially published the most articles related to the prevention of cyberbullying were the Journal of "Computer in Human Behavior" publishing 31 documents, "the International Journal of Environmental Research and Public Health" with 19 documents, the Journal of "Cyberpsychology Behavior and Social Networking" with 16 documents, and the rest of each source published less than 15 documents. Furthermore, Figure 1 also shows that journals with a range of behaviors and the environment in the fields of computers, psychology, and health, dominate the number of publications on cyberbullying prevention.

4.2. The Popular Themes in the Documents Relating to the Prevention of Cyberbullying

The popular themes in the documents relating to the prevention of cyberbullying can be identified through the frequency of the most frequent occurrences in the documents related to the theme. Table 2 shows the words that were mentioned at least 25 times in the documents analyzed in this article.

Table 2. Words that most frequently occur in the documents

Words	Occurrences	Words	Occurrences
adolescent	352	united states	56
bullying	345	statistics and numerical data	55
female	342	peer group	51
male	328	priority journal	51
human	276	risk factor	49
internet	222	social networking online	49
child	187	controlled study	48
humans	180	depression	47
cyberbullying	163	school	47
article	155	mental health	44
adolescent behavior	118	human experiment	42
psychology	111	social support	42
crime victims	96	schools	41
computer crime	94	empathy	36
cyber bullying	94	social behavior	34
major clinical study	89	suicidal ideation	34
crime victim	86	suicide	33
student	84	violence	32
adult	83	review	30
prevention and control	80	sex difference	28
social media	80	surveys and questionnaires	28
students	75	psychological	27
aggression	73	risk factors	27
victim	72	self concept	27
prevalence	70	spain	27
questionnaire	62	crime	26
young adult	57	self report	25

Table 2 shows that the word "adolescent" is the most frequently mentioned word, which is 352 times. Furthermore, the words which were most frequently stated were "bullying" (345 times), “female” (342 times), “male” (328 times), "humans" (276 times), and "internet" (222 times). Specifically, for the word "cyberbullying", some write it in one word, "cyberbullying", while others separately write it in two words, "cyber bullying". Additionally, when these two are combined into cyberbullying, the word is mentioned 257 times. Figure 2 shows the graphical parameters of the data.

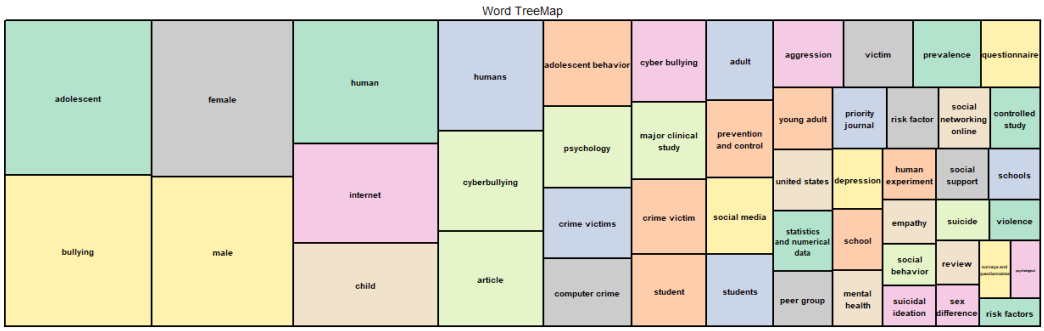

Figure 2. TreeMap for the Documents on Cyberbullying Prevention

Figure 2 shows TreeMap for the frequency distribution of words as shown in Table 2. In this case, figure 2 shows that the word 'adolescents', especially female adolescents, is mentioned more in the documents regarding cyberbullying prevention. This can indicate that cyberbullying more commonly happens among adolescents, especially female adolescents. The results of research from Lindfors, Kaltiala-Heino, & Rimpelä (2012) and the Pew Research Center in Anderson (2018) show that female adolescents experience cyberbullying more than male adolescents (Anderson, 2018; Lindfors, Kaltiala-Heino, & Rimpelä, 2012).

Furthermore, the trend topics from 2010 - 2018 can be seen in Figure 3.

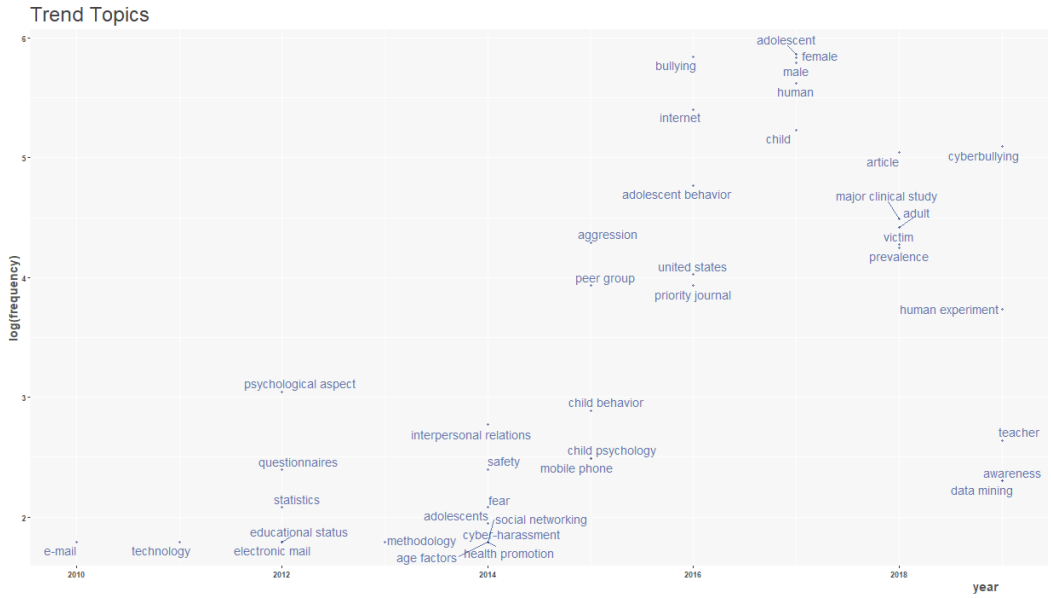

Figure 3. Trend topics in the documents regarding cyberbullying prevention in 2014-2019

Figure 3 shows that the trend topics have been developed from year to year. The most popular themes per year are as follows: in 2010, the theme is "e-mail"; in 2011, the theme is "technology, in 2012, the themes are "psychology aspects, questionnaires, statistics, educational status, electronic email"; in 2013, the themes are "methodology, age factors"; in 2014, the themes are "interpersonal relations, safety, fear, adolescents, social networking, cyber-harassment, health promotion"; in 2015, the themes are "aggression, peer groups, child behavior, child psychology, mobile phones"; in 2016, the themes are "bullying, internet, adolescent behavior, United States, priority journal"; in 2017, the themes are "adolescent, female, male, human, child"; in 2018, the themes are "article, major clinical study, adult, victim, prevalence"; and in 2019, the themes are "cyberbullying, human experiment, teacher, awareness, data mining".

Based on the themes mentioned above, it reveals that the research that includes data mining in the documents related to the prevention of cyberbullying is a trend in 2019. The trend of the theme can show that big data has become a concern of researchers in the prevention of cyberbullying. Moreover, the topics are analyzed based on the clusters shown in Figure 4.

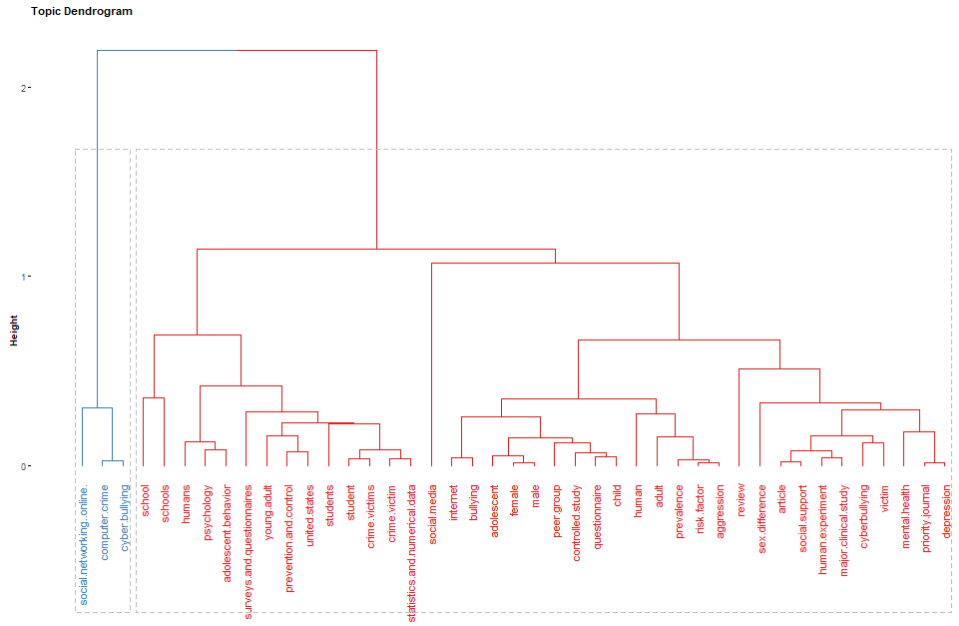

Figure 4. Topic Dendrogram for the documents on cyberbullying prevention

Figure 4 shows that there are two major topic clusters. Clause 1 is the topics about online social networking, computer crime, and cyberbullying. These three themes show the big theme that cyberbullying mostly occurs in social networking. Johnson et al. (2016) state that social media is a media that can be used to explore cyberbullying (Johnson et al., 2016). Meanwhile, according to O'Dea & Campbell (2012), social networking has provided opportunities for cyberbullying to happen among adolescents (O'Dea & Campbell, 2012).

Cluster 2 consists of 3 sub-clusters, where each sub-cluster consists of sub-clusters. Sub-cluster 2.1. consists of certain topics on schools, humans, psychology, adolescent behavior, surveys and questionnaires, young adults, prevention and control, United States, students, criminal activities, crime victims, and statistical and numerical data. Sub-cluster 2.2. consists of the topics on social media, internet, bullying, females, males, peer groups, controlled studies, questionnaires, children, humans, adults, prevalence, risk factors, and aggression. Then, sub-cluster 2.3. consists of the topics on reviews, sex differences, articles, social supports, human experiments, major clinical studies, cyber bullying, victims, mental health, priority journals, and depression.

In cluster 2, it can be seen that these popular themes are produced at least through 3 approaches, that are the survey, experimental (controlled study) and, psychological/psychiatric approaches.

5. Conclusion

The implementation of science mapping to find the popular themes in the field of cyberbullying can be employed through co-word analysis, which is through the analysis of the search results using keywords: protection OR prevention OR against

AND cyberbullying. The results of the analysis reveal that the popular themes that are produced can be divided into several clusters based on the methodological approach.

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