The Effect of Using Virtual Reality to Increase Self-Compassion: Meta-Analysis

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Abstract. Virtual Reality (VR) technology provides an immersive environment that allows users to experience reality. Now, more and more are used to dealing with individual learning problems. This study aims to map the trend of VR use in various research topics and analyze the generalization of the effect of VR on increasing self-compassion. The research method uses a meta-analysis model to explore worldwide public trends in using VR for education. Data is drawn from relevant studies published from 2018 to 2022 from WoS, Scopus, and PubMed Central. The bibliometric analysis technique was used to analyze the resulting data by coupling visual bibliography, co-authorship, co-citation, co-occurrence, and analysis of publication trends of visualization of similarity (VOS) software. OpenMEE software to analyze the generalization of the effect of using VR on increasing self-compassion. The analysis results show that the public's view of VR has not been widely used to overcome research. In various studies conducted by meta-analysis, it was concluded that VR affects increasing self-compassion. The use of VR in overcoming psychological problems and increasing self-compassion can overcome depression problems. The conclusion that can be drawn from this study is that the use of VR can have an effect on increasing self-compassion, and the application of VR can be used in overcoming depression so that it can be used as a literature study for further research on the use of VR.

Keywords: meta-analysis, self-compassion, Virtual Reality

1 Introduction

Learning is a connection between stimulus responses that lead to changes in behaviour. This stimulus-response relationship, according to Thorndike [1], can be strengthened by the readiness to accept the behaviour change (Law of Readiness), given repetition or exercise (Law of Exercise) and given rewards or training results (Law of Effect). The first moment before learning begins is the most important Thorndike's opinion [1] is the Law of Readiness or preparing an individual to be ready to receive learning in the

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classroom. An individual's physical and psychological condition must be prepared to learn. An individual experiences a lot of psychological unpreparedness in the learning process, such as; self-criticism, being less motivated and not believing in their abilities. An individual in the class often has a high level of self-criticism and shyness, so he is less able to get along with his classmates [2]. As a result, an individual becomes lazy and has low motivation to increase his potential both academically and non-academic. Growing self-confidence and motivation can be done by increasing an individual's self-compassion.

Self-compassion interventions are effective in increasing empathy and self-compassion, self-confidence, and reducing stress, anxiety and depression [3] [4] [5]. Self-compassion interventions are based on constructive meditation, where visualization skills are very helpful in accelerating the intervention process carried out by an individual [3]. One of the main difficulties that participants reported during the training was their ability to visualize the intervention in real time. Virtual Reality (VR) can be a helpful tool to overcome this limitation because it can facilitate the construction and visualization of the surrounding conditions [6].

Virtual Reality (VR) is a technology that allows users to interact with a computer simulation environment, be it a real-world simulation environment or an imaginary world [7]. VR is the key to experiencing, feeling and touching the past, present and future. VR systems can be classified into three main categories, non-immersive, immersive and semi-immersive, based on one of the crucial features of VR, including immersion and interfaces or components used in VR systems [8]. VR media creates our own world and reality tailored to the goals to be achieved in introducing an object [7]. VR interventions in human services can include 360° video, Augmented reality, mixed reality, and fully immersive 3-dimensional virtual reality simulations [9]. VR can overcome this challenge by providing an immersive environment for training attention by supporting users who can direct attention to the present moment in a customized virtual setting [10].

VR helps with a more accurate demonstration of functionality or activity. An important aspect of VR in education is that VR content will enable students to recognize and explore abstract or complex knowledge observed in a risk-free environment [11] [12]. The rapid development of VR also brings new challenges because the development of new VR solutions affects the research results. VR is one of the latest techniques in education and entertainment that has proven effective [13]. VR can be a suitable medium because it can smoothly create, maintain, inspect, and change the shape of the environment or objects used in self-compassion interventions and resemble real situations and experiences [14]. VR can be defined as an imaginary visualization technology system that is sophisticated and effective in triggering the emergence of cognitive, emotional, and behavioural responses [15]. This means that VR can modify internal experiences within individuals by changing the external environment and shifting body awareness [16]. The most apparent benefit of VR is a mediated environment that will display an accurate visual simulation to foster the self-compassion of an individual independently without the help of a therapist or psychologist in the intervention process [6]. The use of VR in research shows that implementation for a public school individual can train empathy and self-compassion [17].

The growing scientific research into the application of VR to education has led to a large body of literature exploring the design features, functions of technology, and their impact on learning across various disciplines and contexts [18] [19]. There is an urgent need for a systematic review of the VR literature to consolidate, evaluate, and communicate research evidence that can inform the use of VR in improving the psychological problem of self-compassion. A literature review of research reports on educational technology is critical because it can provide a contemporary overview of technology implementation, key directions for future research, and practical implications for future researchers researching VR [20]. This study aims to map the trend of VR use in various research topics and analyze the generalization of the effect of VR on increasing self-compassion.

2 Method

2.1 Research Design

The selected data set was analyzed using a meta-analysis model with a bibliometric study that identified and analyzed the literature on VR in education [21]. Performance analysis and scientific mapping carried out in the first part of the research are scientific or bibliometric mapping representing how disciplines, fields, specializations, individual papers, and authors are related. Recommendations from bibliometric results are used to generate maps to find out different research topics and structures in the dataset. A second analysis was also performed, sorting the articles in descending order according to the number of citations. Recommendations from [22] were used to complete this part of the study. Tables can be difficult for people using screen reader technology to understand unless they include markup that explicitly defines the relationships between all the components (i.e., headers and data cells). A key to making data tables accessible to screen reader users is clearly identifying column and row headers. In Word, authors should determine which row or rows contain column headers. Below are the steps to do this:

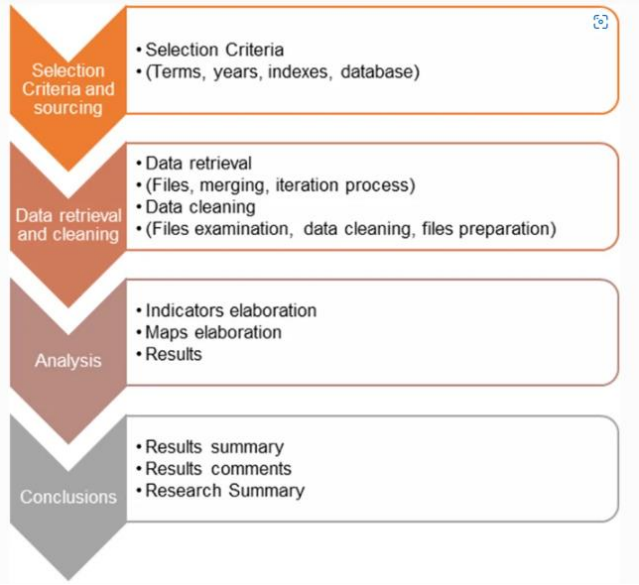

Fig. 1. Research procedure [24]

2.2 Data Collection

Articles which are a representative sample of international scientific activities published in scientific journals are analyzed [25]. In this study, journals and proceedings were found in the databases issued by WoS, Scopus, and PubMed Central. Data is drawn from relevant studies published from 2018 to 2022 from WoS, Scopus, and PubMed Central. Half Width Figures.

2.3 Identify the source

Data were collected from journal articles indexed in the Web of Science Core Collection and PubMed Central. This database was selected due to three criteria:

a. Has a quality index like JCR.
b. Covers the period 2018 – 2022.
c. Have citations and can download the substance of the journal.
d. Talking about Virtual Reality and self-compassion

These characteristics are sufficient to justify their use [25]. The Scopus multidisciplinary bibliographic database was also used to search for information in articles from scientific journals (ASJC) classified into organized hierarchies of fields and subfields [26]. This database was selected due to three criteria:

a. Has a quality index like SJR.
b. Covering period 2018 – 2022
c. Have citations and can download the substance of the journal
d. Talking about Virtual Reality and self-compassion

The search for articles uses publish or parish and the Scopus database, which is then processed with VOS, the bibliophily software used for data analysis. Tracking is limited to articles containing the keyword "virtual reality" in the title. This is included in quotes to get all documents that contain a combination of words in the document title and also has possible combinations with the term self-compassion* used to get articles with titles containing words related to impact*, VR, Virtual Reality*, self-compassion*, and compassion* to get articles about innovation and the effect of virtual reality to increase self-compassion

2.4 Topic selection criteria

The search was conducted in English to find the highest number of documents in the dataset on VR in education. The inclusion criteria applied were the type of document: only selected articles, language: English and year of publication: 2010-2022 and provided the topic of using VR for self-compassion (table 1). The exclusion criteria were to exclude discussions other than the topic of self-compassion. This study has not included VR in various research topics ranging from health, engineering and education to get an overview of the application as much as possible the use VR in multiple issues. This is of great value to researchers, as information is presented on current and future research pathways investigating the usefulness of VR in technology use and virtualization in platforms, applications, games, and video.

Table 1. Journal studies

Study	Research Design	Subject	Instrument
Navarrete, et al,2021 [27]	Experimental Research	College student	*Self-Compassion and Self-Criticism Scale* (SCCS) (Falconer, King, & Brewin, 2015)
		Exp; 21, Con: 21	
Brown et al.,2020	Experimental Research	Patient	
		Eks; 50, Con: 50	
Falconer, et al, 2016	Experimental Research	Patient	
		Eks; 15, Con: 15	
Cebolla et al., 2019	Experimental Research	Patient	
		Eks; 8, Con: 8	
Ryan & Griffin, 2016	Experimental Research	Elementary/junior/high school students	
		Eks; 27, Con: 27	

Note:
Exp : Experimen Class
Con: Control Class

2.5 Data analysis process

The documents in this analysis contain bibliographic information obtained after a manual review of 20 relevant documents found at WoS, 30 at Scopus, and 43 at PubMed Central. Fifty-eight duplicate documents were eliminated, and author and journal names were normalized according to the research topic, which resulted in 5 documents being unified in an excel file. This entire process is summarized in the three stages of the search strategy shown in Fig. 2.

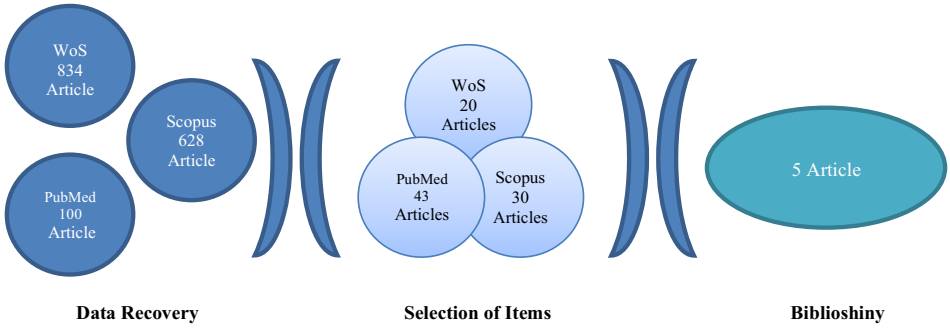

Fig. 2. Article data analysis process

OpenMEE application to determine the generalization of the effect of using VR to increase self-compassion. VOS software was used for data analysis. It is a tool that analyzes all the data identified in the body of literature and identifies the main themes. This application provides a web interface for Bibliometric or VOS software [28] and provides data in graphical format, if desired, to visualize statistics. In this study, graphs depict information about VR in education during the time period selected for the study. Figure 2 summarizes the search strategy used.

3 Results and Discussion

The results obtained from the analysis using the VOS software obtained a visualization that explains the research trend of using Virtual Reality (VR) in research, as follows:

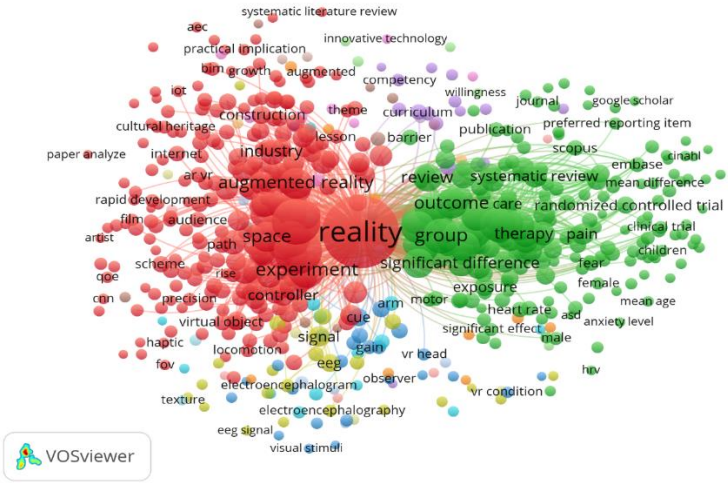

Fig. 3. Mapping research trends with VOS

Research mapping with VOS shows that the use of research is still limited for demonstration of learning in education, such as; space explanation, training for student practice for automotive education, and medical therapy. This makes research on the use of VR to overcome the psychological problems of an individual, both disabled and routine, one of which is the problem of self-compassion. The use of VR to increase self-compassion has not been widely studied. The following mapping results by excluding journal topics show that VR can be used to increase self-compassion, and there are new findings in overcoming depression problems, as shown in the VOS visualization, as follows:

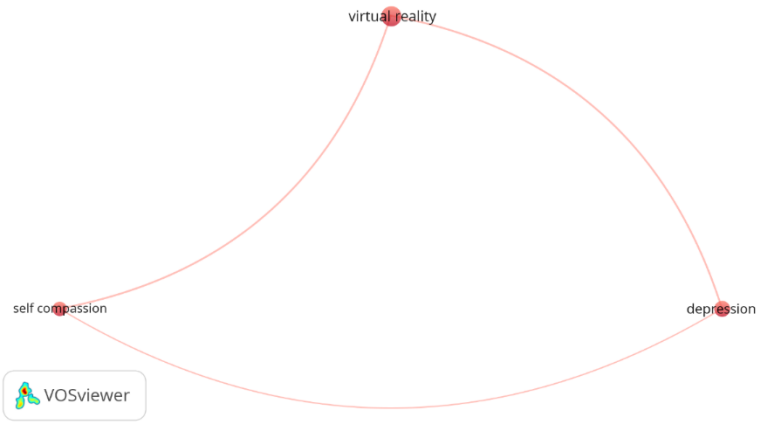

Fig. 4. Mapping of VR usage with VOS

Further analysis to determine the effect of increasing self-compassion, in general, using the OpenMEE application resulted in the following data processing;

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Continuous Random-Effects Model
Metric: Standardized Mean Difference

Model Results

Estimate Lower bound  Upper bound   Std. error    p-Value

0.327       0.073        0.582          0.130      < 0.012


Heterogeneity
tau^2     Q(df=4)     Het.p-Value     I^2

0.000      3.984         0.408         0
```

The results obtained from the OpenMEE analysis show that P-value <0.05, the mean effect size is significant, which means that using VR can increase self-compassion. This can be used as a literature study from five journal studies conducted based on forest plots showing that the experimental group's performance was better than the control group, which means the effect of using VR to increase self-compassion in research subjects.

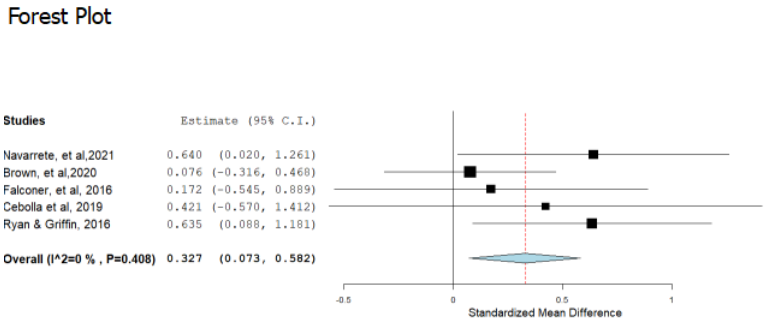

Fig. 5. Forest plot of the effect of VR on self-compassion

Fig. 6. Analysis of the Forest Plot subgroups shows that using VR to increase self-compassion is the most effective effect on student subjects, with a mean effect size of 0.640. Still, it can be used for students, patients, and elementary/junior/high school students.

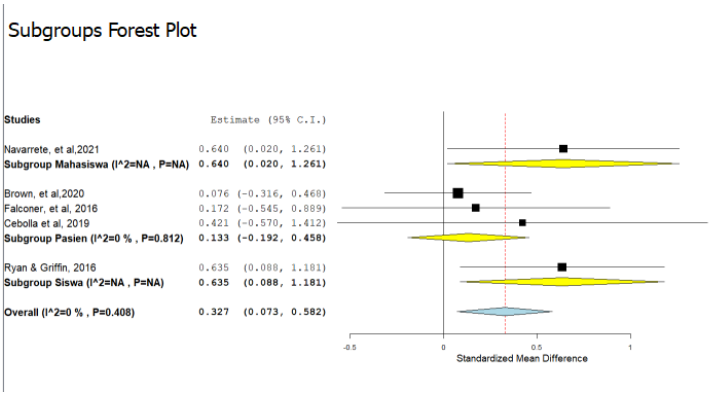

Fig. 7. Subgroups Forest Plot

The results of research on using VR to increase self-compassion have not been widely studied. The analysis of the achievement of the experimental group is better than the control group, which means the effect of using VR to increase self-compassion in research subjects. The subsequent mapping results by excluding journal topics show that VR can be used to increase self-compassion and there are new findings in overcoming depression problems.

Self-compassion is the ability to comfort and care for oneself in suffering, failure, and imperfection rather than taking part in self-criticism [29]. This is important for every human being to survive in his environment. A concept that describes the tendency to understand one's own good and bad when faced with negative experiences [29]. Self-compassion weakens the relationship between stress factors, depression, and environmental stress [30]. The power of self-compassion is to know oneself in showing self-acceptance, compassion and tolerance [31]. Increasing self-compassion can be done by providing an educational environment encouraging students to accept who they are, express gratitude, and cultivate mindfulness [29]. An individual with low self-compassion affects problems in various fields, especially emotions [32] [33]. Academically significant influence is the effect on the results of an individual's academic achievement in schools [34]. Self-compassion can increase subjective vitality and reduce feelings of loneliness in an individual [35]. Self-compassion training is one of the effective therapeutic methods to improve an individual's mental health [35]. VR is a new technology that can be used to increase self-compassion.

4 Conclusion

The use of VR is effectively used to increase self-compassion for student subjects, patients and elementary/junior/high school students. Mapping research trends that have been carried out using VR can not only be used to overcome the problem of self-compassion but can also overcome the problem of depression. The recommendation is that

further research on the use of VR can be carried out for various research topics, especially in overcoming the psychology of both normal and disabled individuals as subjects that have not been carried out in previous research studies.

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