



## Applications of Virtual Simulation in Sports Science in China: A Narrative Review

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### Abstract

Ivan Sutherland, a pioneer in the field of virtual simulation has first described "The Ultimate Display" in 1965 [1], and explained interactive graphics and force-feedback devices. Virtual simulation technology has been widely used in media, entertainment and education fields in many countries, including China. Research on virtual simulation technology in sports and exercise fields has rapidly increased in China with the support of Ministry of Education. Consequently, there is a surge in business/market on virtual simulation technology-related items, such as computers, software and internet. Furthermore, virtual simulation has greater applications in physical education. Adaptation of virtual simulation technology may facilitate to overcome the conventional limitations in physical education. Chinese Ministry of Education urges schools to implement the virtual simulation technology in physical education experiments that could promote innovative skills and abilities of students. However, the knowledge about designing and developing of suitable virtual simulation techniques for physical education programs is not well-known. It is therefore important to study on how virtual simulation technology is applicable in physical education. This narrative review is focused on the studies deal with virtual simulation technology in China and provided perspectives.

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Received Date: 11 Feb 2019

Accepted Date: 12 Jun 2019

Published Date: 17 Jun 2019

#### Citation:

Ye W, Hong F, Korivi M. Applications of Virtual Simulation in Sports Science in China: A Narrative Review. *Sports Med Rehabil J.* 2019; 4(1): 1047.

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**Keywords:** Virtual reality; Exercise environment; Game skills

### Short Communication

#### Present status of virtual simulation research in China

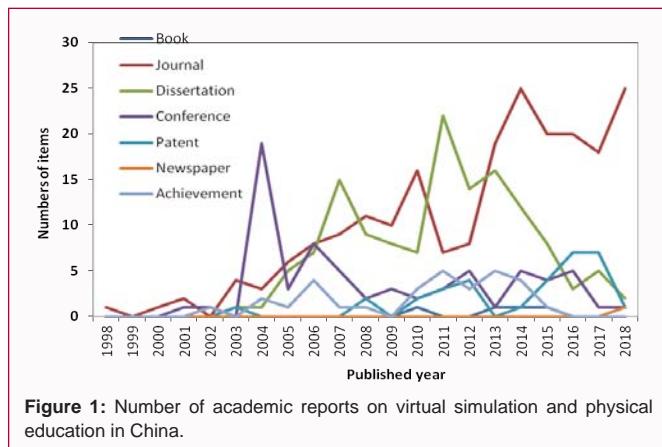
We have conducted a literature search on Chaoxing database, which provides information from the China National Knowledge Infrastructure (CNKI) and Wanfang database. We used different keywords, including "virtual simulation" and "physical education" or "sport" or "exercise" to identify the academic reports relevant to virtual simulation in China. The first report on virtual simulation was identified in 1998, which merely described the virtual simulation applications in sports. No report was found in 1999; however from 2002 the number of journal articles were gradually increased and reached 25 in 2018. Gradual increase of other reports, including conferences abstracts, dissertations and patents indicates increased focus on virtual simulation technology application in physical education (Figure 1). These results laid a foundation for further development and application of virtual simulation experiments in sports science in China.

#### Applications of virtual simulation in sports and exercise

Previous studies emphasized the application of Virtual Reality (VR) in various sports and games in different environments. For instance, VR technology has been used in skiing [2], sailing [3], diving [4], obstacle running [5], and outdoor development [6]. Through the adaptation of VR technology, athletes could able to experience the visualized high-risk environment, which is safe and convenient. In addition, it is possible that athletes could learn some essential tactics prior to take part in the real environment. Virtual reality technology is also useful in individual sport events and group exercise activities. VR technology can be employed through the establishment of human motion models, designing of difficult aerial movements and designing of large-scale crowd activities. Wearing glasses with VR technology in the laboratory not only give the real impression of game fields like table tennis or tennis, but also provides virtual opponents to play and practice anytime.

### Summary

The application of virtual simulation technology in China made a great progress. At present, the application of VR in physical education is mainly about simulation of environment. The application of VR specific to individuals or groups is still in the beginning stage, which needs to be improved through research. The Ministry of Education in China aimed to build about 1000 virtual simulation



**Figure 1:** Number of academic reports on virtual simulation and physical education in China.

experimental projects between 2017 and 2020 in various fields, including physical education to promote the universities across the country. The language used in the virtual simulation website (<http://www.ilab-x.com/list?sid=94>) is Chinese, which need to have an international perspective for global access.

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