Dean&Francis
ISSN 2959-6157

# Virtual reality technology's positive influence on traditional sports

**Chengzhi Yang**[1, *]

[1]Department of communication, Pennsylvania state university Abington,
United States

*Corresponding author:
chengzhiyang2024@outlook.com

**Abstract:**

Because of the skyrocket in development, high technology can be seen everywhere in people's daily lives. New energy cars, new payment methods, and society are developing rapidly. People are getting more and more familiar with the virtual reality technology. VR experience games in shopping malls, advertisements of VR equipment, and the concept of metaverse. All these things bring people a deeper understanding of VR and XR games. Virtual reality games were recognized as a super potential industry in the future. Traditional sport is an industry that influence society for a long period. People's life was somewhat changed by the sport. Some crazy sports fans will put most of their money, effort, and time into sports and supporting their favorite team. Sports are posted everywhere, in films, documentaries, magazines, and on social media. Sports have already become a necessary part of people's daily life. This paper will figure out how the combination of VR technology and traditional sport will bring benefits, and the VR benefits are basically around three directions. First is avoiding injury, and second is both physical and mental health care. The last is the propaganda and generalization of sport in general.

**Keywords:** VR technology; sport; training.

## 1. Introduction

Virtual reality has become a heated topic in recent years. Many people recognize it as a potential industry for the future. Sports are a well-established form of amusement in everyone's daily life. The popularity of traditional sports is extremely high, there are 265 million people are registered players in football worldwide according to the research. 69% of males and 54% of females have taken part in some sports games above 15 years old. On the financial side, the sports industry contributed 14.4 billion dollars in a year, which is 0.8% of Australia's GDP [1]. Compared to sports, video games are a relatively new industry. It has had great influence in the recent decade. In 2019, the gaming industry made a revenue of $120 billion and an audience of about a billion. During the pandemic in 2020, the gaming market in the US has a 27% increase [2]. In 2022, 3,2 billion people played video games and total revenue was $180 billion, which is higher than the movie industry [3]. Take the game Hogwarts Legacy as an example, this game sells about 850 million in 2 weeks [4]. The

ISSN 2959-6157

statistics manifest that both the sport industry and video games are full of potential and have tons of audience. This paper focuses on the combination of VR games equipment and sports and finds out how can it benefit people and bring positive effects to both the gaming field and the sport field. The omni-direction treadmill is the equipment that will effectively make VR sports games possible and useful.

## 2. The Utilization of VR in Sports

### 2.1 Usage of omni-direction treadmill

The first pivotal point of this application is that the omni-direction treadmill can help people avoid getting hurt during the game. One example that illustrates the disadvantage that sports games will bring is Ring Fit Adventure. It's a successful sports game but the one point people are worried about is the safety problem. The game is open to all people from different ages. According to the research, a group of people's average age is about 69.8. 38% of them fell over one time, and 17% of them had the experience of injury when they were playing the game. The exercise they did are basically some yoga pose and some bandings [5]. Especially for VR games, it's easy to feel dizzy, uncomfortable, and fall down if one plays it for a long time without a break. The omni-direction treadmill will perfectly solve this problem. The omni-direction treadmill is used for the moving. With this, players can move wherever they want to. You can move your body in 360 degrees and stretch your limbs. This device will effectively figure out the safety problem. Most people fall down when they playing the games. But the omni-direction treadmill has a backpack and a mechanical limb behind it. It will hold people to keep them not falling. This solves the safety problem, and at the same time gives players flexibility. They can run fast or walk slow as they want. The equipment will detect it and follow the player's steps. Not only the speed can be changed, but the trajectory can also be changed as well. The Omni direction treadmill will bring the player haptic feedback in order to bring the player a vivid feeling and figure out the safety problem at the same time. Keeping healthy and avoiding injury is a pivotal thing for athletes as well. Omni direction treadmill will effectively keep them from injury and provide better training. According to the research, when people are on the omni-direction treadmill, they have a higher level of muscle activation, which results in higher energy consumption [6]. The omni-direction treadmill will benefit both normal players and professional athletes.

### 2.2 Page Numbers VR technology in training

The VR soccer game will bring athletes both physical and mental care aid.. For these athletes, mental health is a vital issue. According to the NCAA's official website, about 9 million (4%) of athletes are suffering from mental illness. Especially when the game is at the last moment and only a few seconds for them to get the score. That kind of situation will really bring these athletes to stress. 1/8 elite athletes have the PTSD [7]. The application of VR equipment in the training will effectively help athletes overcome fear and anxiety. Omni direction treadmill will engage with athlete's learning, and training. The athletes are all stressed when they do the penalty kick at essential moments. This will not only provide more real reactions but also effectively help these athletes do their training and help them overcome anxiety and terror. It can make these athletes learn how to confront challenges and facilitate their skills as well. Some research (Table 2), it can significantly shows that athletes' training interaction with VR is more effective and have a better improvement. The VR-based imagery training program is the most effective and has potential compared to those currently used methods. There are three experiment studies on three different sports and give the result that VR training can help people improve skills or not. They are dart board, baseball, and football. Firstly Trip use wall projection of dart board and do a study for 1 week. This study compared accuracy of throwing a dart after VR trainning. Thirty-eight people are randomly assigned to three groups. They are the group with VR training, the group with real-world training, and the group without any training. The result is evaluated in two directions, the accuracy and the quiet eye duration (QED). The whole experiment was separated into three sessions, and each session had 50 chances to throw. After the experiment, the result manifested that both the group with VR training and the group with real-world training had non-significant improvement compared to the group without any training. All of these three groups' quiet eye duration is quite the same. Compared to the group with real-world training, the group with VR training has obviously better accuracy and the QED. For these ball sports, there is an intervention study about baseball batting training. As common knowledge, baseball is a challenging sport to play. The second experiment studies whether VR training can help improve batting skills or not [8]. All eighty high school baseball players are only separated into 4 groups. Group 1 is adaptive batting training with VR, group 2 is a VR batting practice group, group 3 is a real batting practice group and the control group 4 is without any training. All the eighty participants will be trained in 6 weeks with two parts of 45-minute training per week.

There are 8 variables and the result was defined by two majority variables of them. They are hit rate, and numbers of correctly identified pitches. After the calculation of the rate each player's on-base percentage and give the result. The result states that in group 1, 7 out of 8 variables have improved, group 2 have improved 3 out of 8 and both group 3 and group 4 have only improved 2 out of 8. Also, the players' on-base percentage of group 1 is higher than other groups. Ross-Stewart got a group of NCAA Division 1 baseball players and start a VR imagery training for three weeks There are 5 people who quit the program, and the left 22 people have significant results in skills and goals. The result also illustrates that VR training can benefits their decision making. Lastly, for the goal sport, VR training also works a lot. Not only for improving the skills, VR training can also help athletes do the rehabilitation. Nambi have 45 university football players, and he compared the VR raining with traditional training according to different directions like pain intensity, spirit, jump performance and player wellness) are tested after the training is going on for 4 weeks, 8 weeks, and 6 months. The result manifests that jump performance in VR training is significantly better than in the traditional group. The result also claimed that VR training groups have a significant improvement in pain intensity and player wellness. Overall, VR training can bring benefits in different kinds of sports and help athletes to recover better [9].

**Table 1. The experiment of VR training in three categories of sports.**

| Reference | Sport(s) | VR technology | Performance factors and aims | Key findings |
|---|---|---|---|---|
| Trip et al.(2015) [10] | Darts | Virtual dart board, projected on a wall | Exploring whether VR darts practice can improve real-world throwing and vice versa [10]. | - Throwing accuracy increased descriptively but not significantly in either of the training groups; throwing accuracy decreased slightly in the control group. There was no significant difference in QED between the groups during the pre- and post-test. Virtual throwing training significantly improved both throwing accuracy and QED in comparison to real-world throwing training [10]. |
| Gray [11] | Baseball batting | Screen of 2.11m x1.47m | Comparing the effect of different kinds of extra VR trainings on results in performance tests as well as the future baseball career to the effect of extra real-world training and no extra training [11]. | -For all eight metrics, the VR adaptive group exhibited significant pre-post improvements. -The real-world batting practice group significantly improved on 7/8 metrics before and after. -The VR batting practice group demonstrated notable progress on 3/8 measures. -The control group significantly improved on two out of eight criteria. -OVP was significantly higher in the VR adaptive group compared to the VR batting practice group and the control group, and slightly higher in the real-world batting practice group. -There were eight participants in the VR adaptive group who had played at least one season at a level above high school, one VR batting practice participant, three real-world batting practice participants, and one control participant [11]. |

ISSN 2959-6157

| | | | | |
|---|---|---|---|---|
| Ross-Stewart et al. (2018) [12] | Baseball | Color Cross VR goggles | Exploring whether VR table tennis practice improves performance in real-world table tennis compared to a group with no practice at all [12]. | The VR group exhibited significantly larger improvements in both quantitative and qualitative measures when compared to the control group. -The control group also showed improvements, with 85.7% of participants showing improvements, despite 93.1% of the VR group participants showing improvements [12]. |
| Nambi et al..(2020) [13] | Football (soccer) | Screen , not specified | Comparing the effect of VR training on clinical (pain, wellness) and athletic performance (sprinting, jumping) of university football players with chronic lower back pain to the effects of isokinetic and conventional training [13]. | -Pain intensity and player wellness improved significantly in all groups; however, at all follow-up measures, the VR group's improvements were noticeably greater than those of the other two.-Sprint performance improved dramatically for all groups, with VR and IKT outperforming control by a large margin and VR outperforming IKT by a little margin. -Jump performance improved significantly for all groups, with the VR group showing bigger improvements [13]. |

## 3. Conclusion

In conclusion, this study finds that VR industry has had a huge positive influence on the sports industry. For VR sports games, the Omni treadmill can keep players from getting injured and help them do the basic movement they want on one platform. More importantly, VR technology makes sports training and rehabilitation a more potential field. Totally different categories of sport are proved that VR training can help athletes have better improvements. The same as rehabilitation, VR training can figure out both physical and mental health problems. For physical health, VR training can help athletes who are injured alleviate the pain. For mental health, the VR headset can modify the crucial moment of the game and help players get used to it and overcome it. In the future, these advantages of VR technology will bring more and more people interested in sports. More and more industries will benefit from the combination of these two fields. The use of VR technology in rehabilitation will facilitate the combination of the medical field and VR technology as well. However, there are also some disadvantages of such kind of VR application. The one obvious point is that not everyone can easily adapt to this VR equipment, people need to spend time and effort on learning how to use this equipment, which really needs patience because it takes a lot of time to get used to it. Also, the price is a part of it. The price of the VR equipment is a lot and also needs a lot of space for VR training or games.

## References

[1] N/A. "Ranked: The World's Most Popular Sports." TopSport, 16 Apr. 2022, news.topsport.com.au/ranked-the-worlds-most-popular-sports/.

[2] Metzger, Florian, et al. "An Introduction to Online Video Game QoS and QoE Influencing Factors." IEEE Communications Surveys & Tutorials, vol. 24, no. 3, 2022, pp. 1894–1925, https://doi.org/10.1109/comst.2022.3177251

[3] Pales, Eli. "Microsoft and Activision-Blizzard: Examining the Largest Tech Acquisition of All Time." Papers.ssrn.com, 11 May 2022

[4] N/A."As Video Games Grow, They Are Eating the Media." The Economist.

[5] Lap, Wayne, et al. "Feasibility, Safety, and Effects of a Nintendo Ring Fit AdventureTM Balance and Strengthening Exercise Program in Community-Dwelling Older Adults with a History of Falls: A Feasibility Randomized Controlled Trial." Geriatrics and Gerontology International/Geriatrics & Gerontology International, 13 Dec. 2023, https://doi.org/10.1111/ggi.14771.

[6] Soni, Smit, and Anouk Lamontagne. "Characterization of Speed Adaptation While Walking on an Omnidirectional Treadmill." Journal of NeuroEngineering and Rehabilitation, vol. 17, no. 1, 23 Nov. 2020, https://doi.org/10.1186/s12984-020-00787-y.

[7] Davoren, Ann Kearns, and Seunghyun Hwang. "Mind, Body and Sport: Depression and Anxiety Prevalence in Student-Athletes." NCAA.org, 8 Oct. 2014, www.ncaa.org/sports/2014/10/8/mind-body-and-sport-depression-and-anxiety-

prevalence-in-student-athletes.aspx.
[8] Richlan, Fabio, et al. “Virtual Training, Real Effects: A Narrative Review on Sports Performance Enhancement through Interventions in Virtual Reality.” Frontiers in Psychology, vol. 14, 19 Oct. 2023, https://doi.org/10.3389/fpsyg.2023.1240790.
[9] Nambi G., Abdelbasset W. K., Elsayed S. H., Alrawaili S. M., Abodonya A. M., Saleh A. K., et al.. (2020). Comparative effects of isokinetic training and virtual reality training on sports performances in university football players with chronic low back pain-randomized controlled study. Evid. Based Complement. Alternat. Med. 2020, 1–10. doi: 10.1155/2020/2981273, PMID.
[10] Tirp J., Steingröver C., Wattie N., Baker J., Schorer J. (2015). Virtual realities as optimal learning environments in sport—a transfer study of virtual and real dart throwing. Psychol. Test Assess. Model. 57, 57–69.
[11] Gray R. (2017). Transfer of training from virtual to real baseball batting. Front. Psychol. 8:2183. doi: 10.3389/fpsyg.2017.02183.
[12] Ross-Stewart L., Price J., Jackson D., Hawkins C. (2018). A preliminary investigation into the use of an imagery assisted virtual reality intervention in sport. J. Sports Sci. 6, 20–30. doi: 10.17265/2332-7839/2018.0
[13] Nambi G., Abdelbasset W. K., Elsayed S. H., Alrawaili S. M., Abodonya A. M., Saleh A. K., et al.. (2020). Comparative effects of isokinetic training and virtual reality training on sports performances in university football players with chronic low back pain-randomized controlled study. Evid. Based Complement. Alternat. Med. 2020, 1–10. doi: 10.1155/2020/2981273