

28th ECSS Anniversary Congress, Paris/France, 4-7 July 2023

Development of an innovative virtual reality training system and its effect on mental training in gymnasts

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INTRODUCTION

Research on the use of virtual reality (VR) for mental training in athletes is increasing. VR can simulate situations that athletes may not usually experience, including unusual competition scenarios and environments such as stadiums the athletes have not visited before. We have been developing an innovative VR training system (iVRTS) and have used it for mental training to enhance athlete performance. Users wear a head-mounted display (HMD) and can move freely in a VR environment constructed based on an actual stadium. However, it is unclear whether the iVRTS is effective for mental training, such as performing breathing techniques while experiencing a simulated stressful situation. Therefore, this study aimed to assess the effectiveness of iVRTS for mental training by analysing biometric information.

METHODS

Participants were 20 male gymnasts (mean age \pm standard deviation: 19.41 \pm 0.91 years) who had competed at the national level. Participants were assigned to the VR group or the control group. Both groups had five mental training sessions over a 4-week period (Fukami, 2019). Each session comprised two 5-min breathing activities. In the first, participants stood with their eyes opened and breathed normally. In the second, they continued to stand while performing a breathing technique and were allowed to look around while turning around; the VR group, who wore a HMD (Vive, HTC) during the second activity, viewed a VR environment of an actual gymnastics stadium filmed using a 360-degree camera (QooCam 8K, KanDao) during a competition, whereas the control group saw only the gymnasium where they train. To determine the effect of the experience on mental training, salivary amylase (SOMA Cube Reader, YKC) and mental sweating (eVu TPS, MP Japan) were measured. To examine the iVRTS effect, measurements were compared between the first and final sessions (Times 1 and 2, respectively). The Kolmogorov–Smirnov test was performed to assess the distribution of the data, and the Wilcoxon-signed rank test and Mann–Whitney U test were performed to compare the data between the VR group and the control group and between Times 1 and 2.

RESULTS

There was a significant difference in the salivary amylase results between Times 1 and 2 in the VR group, but no significant differences were found in mental sweating between Times 1 and 2 or between the groups.

CONCLUSION

These results indicate that mental training using iVRTS reduces the stress response, suggesting its potential to contribute to improved psychological skills in athletes. Because salivary amylase is associated with both the sympathetic and parasympathetic nervous systems, breathing techniques performed while using the iVRTS might be useful for acquiring relaxation skills.

REFERENCES

Fukami Masashi (2019) Investigation of the effect of continuous training in breathing techniques in a virtual reality environment. Nihon University journal of humanities and sciences, 24(1, 2, 3): 237-259.

Topic: Psychology

Presentation: Poster

