Zombie Fit!: Using Virtual Reality Games to Promote Physical Exercise

Jose Franco Baquera
NMSU
Las Cruces, USA
jose5913@nmsu.edu

Bianca Lujan
NMSU
Las Cruces, USA
bianc19@nmsu.edu

Muhammad Mohsin
NMSU
Las Cruces, USA
zubair@nmsu.edu

Diondra Silva
NMSU
Las Cruces, USA
dsilva40@nmsu.edu

INTRODUCTION

Have you ever thought about being immersed in a virtual reality game while also improving your physical health? Designing new innovative and immersive ways of affording exercise is of great importance since many Americans do not exercise their recommended amount and thus places them at a higher risk of contracting diseases [4]. The most significant conditions for a successful virtual reality exergame include the following: intricate music, facilitation of leadership for novice players, providing achievable short and long-term goals, hiding players' fitness levels, avoiding barriers for grouping, and actively assisting players in forming groups [5]. There are other existing conditions that help aid the success of a virtual reality exergame. For example, designers should also keep in mind immediate feedback, game challenge, and virtual rewards when they are designing their exergame [2]. A few systems have been created that attempt to aid in motivating individuals to exercise. The most prominent ones include the Nintendo Wii and Microsoft Xbox's Kinect [3]. This concept was taken a step further by the virtual reality exergame Astrojumper, which integrates full-body activity and factors of replayability [1].

Figure 1. Exergame Astrojumper in action [1].

This was one of the few gaming systems that we researched that combined an exercise game and virtual reality, which is what our system aims to do. Our research will try to address the practicality, feasibility, and effectiveness of a Zombie-themed virtual reality exergame.

CONCEPTUAL BASIS

Our system, *Zombie Fit!*, aims to increase the levels of physical activity for individuals that wish to participate in exercise but cannot due to several reasons (e.g. lack of motivation, time management, etc.). The system will try to combine a zombie virtual reality game with effective exercise routines such as running and squatting. In order to determine if our changes made an improvement, data will be collected on various individuals before and after they use our system through questionnaires and brief one-to-one interviews. This data will then be compiled, analyzed, and used to determine whether attitudes towards exercise improved for those who previously did not feel enthusiastic about it, and whether or not exercise enthusiasts would use our system to supplement their exercise routines. Such a system would be designed using virtual reality (VR) headsets and game controllers and would expand the list of "traditional" exercise approaches (e.g. gym, home fitness equipment, jogging at a park, etc.) to include more immersive methods.

RESEARCH COMPONENTS

There are several crucial components of research that need to be conducted in order to successfully implement our system. The first research component will focus on the effects of different environments on exercise motivation. Questionnaires will be used to collect data to see whether people prefer to exercise in certain locations (e.g. at home, at a gym, in nature, etc.) and why they prefer them. The result of gathering and analyzing this data will consist of a specific location that the largest percentage of participants choose as an ideal exercise location.

The second research component will focus on whether or not video games help motivate individuals to start exercising or to exercise more. Open-ended interviews and direct observation of participants using the system will be used to collect data to see if a hybrid between gameplay and exercise is helpful, distracting, motivating, and/or frustrating. Our hypothesis is that the *Zombie Fit!* system will motivate individuals to exercise more than conventional methods.

The third research component will focus on how affective it is to exercise using a virtual reality game. Direct observations on how many calories participants lose while exercising through conventional methods and while using the system will be recorded and analyzed. Our hypothesis is that similar exercising routines in both *Zombie Fit!* and conventional methods result in an approximate equal

number of calories burned (e.g. walking a total number of 100 steps would result in approximately an equal number of calories burned, regardless of which method is used).

The last research component will focus on the consequences of virtual reality when used to simulate specific exercise movements (e.g. walking in place, squatting, etc.) for long periods of time. We will directly observe individuals who test our system and interview them, once they are finished, to see whether they experience any dizziness, nausea, or other uncomfortable experiences. The result of these direct observations and interviews will consist of a list of uncomfortable experiences, as well as evidence that supports the feasibility of using VR headsets to exercise in the long run (e.g. do negative experiences affect the exercise routine and, if so, do users eventually get used to the new environment?).

RESEARCH BENEFITS
Essentially, the basis for innovation is simple: New interactive and enjoyable systems need to be designed in order to motivate individuals to exercise more. While there are other systems that combine exercise and video games, there are only a few that combine exercise and virtual reality games. The proposed activity is extremely important since it helps researchers conclude if it is practical, or even feasible, to combine exercise routines with virtual reality games. Furthermore, it is expected that the proposed work will develop techniques in game design that are effective in maximizing exercise while minimizing the negative effects of virtual reality (e.g. nausea, dizziness, etc.). Our system and its accompanying research would help improve the well-being of individuals in our society since it would provide alternative choices to those who do not feel comfortable exercising in public spaces (e.g. individuals with anxiety disorders, individuals who are out of shape and fear potential judgment at a gym, etc.). The system would also help increase public engagement and understanding of physical education and virtual reality, as well as contribute to research for newer at-home exercise technologies. Lastly, if such a system is proven to be feasible and practical, then an increase in partnerships between health and user-interface researchers, video game designers, and video game manufactures (both hardware and software) would occur.

TEAM
Our team is composed of four members: Jose Franco Baquera, Bianca Lujan, Muhammad Mohsin, and Diondra Silva. All members of the team are computer science majors with programming and user-interface design experience. More specifically, Franco has worked with virtual reality headsets before and has programmed a few for middle-school students. Furthermore, he has developed and implemented a video game for an undergraduate class and knows how to adhere to well-established software development practices.

Lujan is acquainted with individuals who have experience in kinesiology. Here, she can interview these individuals and ask them for input, suggestions, and information on exercise. Furthermore, she has done several computer science research projects before and knows how to produce adequate documentation.

Mohammed has used Unity, a video game engine, to develop video games before. His skills learned here can be used to help develop our system. Furthermore, he is also a video game player himself, meaning that he can provide new insights and suggestions that aim to prove the interaction between users and our system.

Silva has also implemented a video game for an undergraduate class. Here, she developed and designed the visual graphics for the game, including game characters and world maps. Furthermore, she currently conducts research for Dr. Z. Toups at New Mexico State University (NMSU). Her research focuses on the importance of sounds in video games and how they cause a shift in the flow of the game. In addition, she also conducts research on developing and using techniques to better engage players into a game.

Each individual team member is suited for carrying out the purposed research and has significant attributes that will contribute to the overall success of the project. The team will achieve its goal by collectively doing research and dividing up the total amount of work between the four group members. Such division of work will take into account each member's strength and weaknesses, as well as relevant experience.

REFERENCES

[1] Finkelstein, S., Nickel, A., Lipps, Z., Barnes, T., Wartell, Z., & Suma, E. A. (2011). Astrojumper: Motivating exercise with an immersive virtual reality exergame. *Presence: Teleoperators and Virtual Environments*, *20*(1), 78-92.

[2] Lyons, E. J. (2015). Cultivating engagement and enjoyment in exergames using feedback, challenge, and rewards. *Games for health journal*, *4*(1), 12-18.

[3] The Home Fit Freak. (2019, March 2). A Guide to Exergaming and the Best Exergames. Retrieved from https://thehomefitfreak.com/exergaming-best-exergames-nintendo-xbox-playstation/.

[4] U.S. Department of Health & Human Services. (26 January 2017). Facts & statistics. Retrieved from https://www.hhs.gov/fitness/resource-center/facts-and-statistics/index.html

[5] Yim, J., & Graham, T. C. (2007, November). Using games to increase exercise motivation. In *Proceedings of the 2007 conference on Future Play* (pp. 166-173). ACM.