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Ring-Fit Adventure™: Psychological and Qualitative Outcomes of a Novel Active Video Game Intervention

Kameron B Suire[1]*, Katherine Spring[2], Chloe Jones[2], Darby Winkler[2], Alexandra Carroll[2], Monaye Merritt[2] and Danielle D Wadsworth[2]

[1]Division of Physical Activity and Weight Management, Department of Internal Medicine, University of Kansas Medical Center, Kansas City, Kansas, United States

[2]Exercise Adherence and Obesity Prevention Laboratory, School of Kinesiology, Auburn University, Auburn, Alabama, United States

Abstract

Introduction: There is evidence to suggest a potential relationship between the self-determination theory (SDT) and active video games (AVG's). With the resurgence of AVG's through Ring-Fit Adventure, this potential relationship needs to be further investigated. It is also pertinent to understand how the participants feel about Ring-Fit Adventure after using it, especially as it may help explain any changes in SDT variables. The purpose of this study was to investigate the impact of Ring-Fit Adventure on SDT-related variables and understand the experiences of the participants after the intervention.

Methods: 15 adult women participated in Ring-Fit Adventure sessions, which took place twice a week for 45 minutes lasting over 8 weeks. Psychological constructs falling under the realm of SDT were measured by validated surveys. Interviews were conducted at the conclusion of the study and interpretive phenomenological analysis was used to detail how participants made sense of their experience with Ring-Fit Adventure.

Results: Paired samples t-tests from pre-post revealed significant increases in autonomy $t(13)=6.27$, $p<0.00$. Competence $t(13)=7.05$, $p<0.00$. Relatedness $t(13)=4.96$, $p<0.00$. There were significant decreases in more extrinsic regulation: Amotivation$(13)=2.49$, $p=0.03$, external regulation $t(13)=6.27$, $p=0.01$, interjected regulation $t(13)=2.98$, $p<0.00$. There were significant increases in more intrinsic regulation identified regulation $t(13)=3.31$, $p=0.01$. Integrated regulation $t(13)=6.71$, $p<0.00$. Intrinsic regulation $t(13)=5.41$, $p<0.00$. Participants enjoyed the ability to choose exercises, which may support the autonomy findings. The participants also felt confident that they would be able to complete Ring-Fit Adventure sessions at home in the future, which may support the competence findings. All participants stated they enjoyed using Ring-Fit Adventure and 10 of the 14 subjects that completed the study also stated they either intended or wanted to purchase it for themselves to use after the study.

Conclusions: After completing 8 weeks of sessions using Ring-Fit Adventure, there were significant changes in all SDT-related variables. Participants enjoyed using this technology and the experiences with the game may support some of the SDT-related findings. Future studies should focus on increasing and diversifying the sample and determining the duration of the effect.

Correspondence to: Kameron B Suire, Division of Physical Activity and Weight Management, Department of Internal Medicine, University of Kansas Medical Center, Kansas City, Kansas, United States; E-mail: kameronsuire@gmail.com

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Introduction

Over the last decade active video games (AVG's) have emerged as a unique opportunity to merge popular entertainment with potential health benefits. AVG's prompts physical activity or exercise through interactive gameplay [1]. As almost 277 million Americans play video games [2], and over 75% of adult gamers spend at least three hours a week playing video games in the United States [2], AVG's provide an opening for exercise within the home. Furthermore, AVG's may be more important as we see the effects of social distancing restrictions and loss of physical activity opportunities due to COVID-19 [3-7].

There is evidence to suggest a potential relationship between the self-determination theory (SDT) and video games [8], but also AVG's [9-12]. The video game technology utilized in these studies is more than a decade old don't utilize more updated technology. New technology may present new information on the relationship between SDT and AVG's especially as AVG's experiencing a resurgence.

Although the popularity of AVGs on home consoles appeared to peak with Wii Fit™ on the Nintendo Wii™ [13], a new AVG titled Ring Fit Adventure™ played on the Nintendo Switch™ is starting to challenge that narrative. The Nintendo Wii, Nintendo's previous best-selling home console, sold about 101 million units, with Wii Fit selling over 22 million units [13]. The Nintendo Switch™ has now surpassed the Nintendo Wii with 114.33 million units sold as of September 2022 [14]. Ring Fit Adventure™ is closing in on the total sales of Wii Fit with about 15 million units sold despite only being on the marketplace for 3 years [14]. Wii Fit was a cultural and video game sales phenomenon, and we are witnessing a similar occasion once again. Ring Fit Adventure™ is a unique game that uses a ring, similar to a Pilates ring, for resistance in numerous upper and lower body exercises. The intensity and difficulty

of the exercises increase as the levels are surpassed. Throughout the gameplay, exercises are detailed in written and visual demonstrations. Only two studies have investigated the Ring Fit Adventure™. One conducted among children found it to require higher levels of energy expenditure compared to the Nintendo Wii, dance mats, and Xbox Kinect [15]. The other study examined patients with chronic low back pain and found Ring Fit Adventure™ increased pain self-efficacy and reduced pain [16]. As minimal data exist on the psychological and qualitative effects of Ring Fit Adventure™ further investigation is required. Therefore, the purpose of this intervention was to investigate the impact of Ring Fit Adventure™ on SDT-related constructs over an eight-week intervention. This intervention also had the goal of detailing the experiences of the participants through qualitative interviewing. Finally, while many feel video games are primarily played by young boys, the average age for a video game player is 31 years old and 45% of those who play games are female in the United States [2]. In addition to this, it appears obesity impacts females at a higher rate than males globally. It was estimated that 15% of all females were obese in 2016 compared with 11% of males [17]. One study also found that a staggering 87% of 151 countries included in the analysis showed a higher female obesity prevalence compared with males [18]. However, 31.7% of women are inactive while 23.4% of men are inactive globally [19]. Therefore, we decided to purposely sample adult women.

Methods

This single-armed study was approved by the University Institutional Review Board for Research Involving Human Subjects and followed the standards set by the Declaration of Helsinki under protocol 21-001 MR 2101. Each participant read and signed a written informed consent and completed the Physical Activity Readiness Questionnaire (PAR-Q). Participants had to answer "no" to all questions on the PAR-Q to participate in the intervention.

Participants

Participants were recruited by word of mouth, e-mail, flyers, and social network blasts within the community with a three-week window to join the study. To be eligible for this study, participants had to be: female, low risk for medical complications from exercise (as determined by the PAR-Q), currently not exercising, and not pregnant. A total of 15 female subjects were screened, found to be eligible, and consented to participate in this study. Table 1 displays demographic information at baseline.

Questions regarding demographics resided in the base questionnaire and included race, sex as assigned at birth, and age. Psychological constructs falling under the realm of SDT including behavioral regulation, autonomy, relatedness, and competence were completed pre and post. The Behavioral Regulation Exercise Questionnaire version 3 (BREQ-3) is a 24-item 5-point (ranging from "not true for me" to "very true for me") Likert -type scale used to detail where participants fall on the continuum of behavioral regulation [20]. The questionnaire

Table 1: Means (standard deviations) and percentages for demographic variables at baseline.

Variable	(*n* = 15)
Age (yrs)	45.93
BMI kg/m^2	31.88
% White	80%
% Black	13.3%
% Asian	6.7%

BMI = Body Mass Index

consists of 24 items with 4 questions for each subscale (amotivation, external, introjected, identified, integrated, and intrinsic). Amotivation describes a missing intention for action or simply acting aimlessly. External regulation occurs when actions revolve solely around external rewards or consequences. Introjected regulation occurs when actions revolve around guilt, pressure from important people, and motivation to conform to social norms. Identified regulation occurs when the action is personally valued due to its involvement with a personal goal. Integrated motivation occurs when actions are directed by an integrated form of identity built of values that have become a part of the self. Intrinsic regulation occurs when the actions are guided by enjoyment, interest, or knowledge, and the action is valued for itself rather than any consequences because of the action [21]. Each subscale was differentially weighted: amotivation, −3; external regulation, −2; introjected regulation, −1; integrated regulation +1; identified regulation, +2; intrinsic regulation, +3. Scores for amotivation can range from -60 to 0. Scores for external regulation can range from -40 to 0. Scores for introjected regulation can range from -20 to 0. Scores for integrated regulation can range from 0 to 20. Scores for identified regulations can range from 0 to 40. Scores for intrinsic regulation can range from 0 to 60. Previous researchers provided evidence of content and criterion validity and found strong score reliability [20,22, and 23]. In the current study, reliability scores of the scales within the BREQ-3 ranged from α = 0.76 to 0.97.

The Basic Psychological Needs Exercise Scale (BPNES) is a 5-point (ranging from "I don't agree at all" to "I completely agree") Likert-type scale which measures autonomy and competence satisfied in exercise [24] scale includes 8 items, 4 each representing autonomy and competence. Scores for both autonomy and competence can range from 4 to 20. The need for competence is the understanding that humans need to have mastery over their environment and feel adequate and competent. The need for autonomy refers to a need for control in one's ventures and an internal locus of causality [25]. Previous researchers provided evidence of content and criterion validity and found strong score reliability [25-27]. Within the current study, the reliability scores of autonomies and competence were α =0.96 and 0.97 respectively.

The Relatedness to Others in Physical Activity Scale (ROPAS) is a 6-point (ranging from "false" to "true") Likert-type scale which assesses the psychological need for relatedness, specifically focusing on physical activity [22]. The need for relatedness refers to a need to feel connected and a sense of belonging [25]. The scores for relatedness can range from 6 to 36. Previous researchers provided evidence of structural and criterion validity and found strong score reliability [23]. In the present study, the reliability score for the ROPAS scale was α=0.99. While the BPNES scale also measures relatedness, it focuses on structured exercise exclusively and with whom the participant exercises; however, relatedness experienced in exercise may be served in other ways. For example, the ROPAS scale inquires "I am supported by others in this activity" and "I have a close bond with others". These questions do not rely on an exercise partner as relatedness can be fulfilled by those not physically exercising with the participant.

A semi-open interview one week after the final dose of the respective intervention was delivered to collect qualitative data. There were five questions read in every interview and potential follow-up questions were asked to probe on a topic if needed. Interview questions can be found in Table 2.

Data Analysis

Data were analyzed with SPSS 26. Paired sample t-tests assessed

Table 2: Interview questions.

Question 1	Describe your experience during the study.
Question 2	What did you enjoy about the game?
Question 3	What didn't you enjoy about the game?
Question 4	Do you think you could play the game at home by yourself? Why or why not?
Question 5	Would you keep playing the game if you had access to it?

differences in all psychological changes from pre to post-test. G*power indicated a required sample size of 16 and was used to calculate post hoc power analysis for the paired t-test [28]. Probability values of $p<0.05$ were considered significant.

Interpretative phenomenological analysis (IPA) was utilized as a methodology aiming to examine how the participants made sense of their experiences within this weight management intervention, as most of it took place during the COVID-19 pandemic [29]. Previous interventions have utilized this method to better understand exercise habits [30,31]. To achieve this, transcripts were read multiple times, coded line-by-line for significant findings on one margin, then once again for emerging themes on the opposite margin. A summary table was then written for each participant to compare across all participants for themes. Finally, a master table was created with all major themes. A discussion between co-authors took place to examine the data alongside transcripts to further hone the themes.

Results

Table 3: Mean scores (standard deviations) by treatment condition.

Variable	Pre	Post	*p*	Effect size (η_p^2)
Autonomy	9.21 (4.17)	15.50 (1.23)	0.00**	1.68
Competence	8.64 (4.29)	15.86 (1.51)	0.00**	1.89
Relatedness	23.71 (7.80)	31.71 (3.81)	0.00**	1.29
Amotivation	-9.00 (10.85)	-1.93 (1.93)	0.03*	.66
External	-10.86 (8.03)	-4.43 (3.16)	0.01*	.82
Introjected	-8.57 (2.85)	-4.29 (2.13)	0.00**	1.89
Identified	10.00 (3.42)	12.29 (1.68)	0.01*	.88
Integrated	13.86 (7.17)	20.86 (5.13)	0.00**	1.79
Intrinsic	24.43 (10.97)	36.64 (6.68)	0.00**	1.45

Where: *Denotes a significant change ($p < 0.05$); ** Denotes value less than 0.01; Score ranges: Autonomy = 4 to 20, Competence = 4 to 20, Relatedness = 6 to 36, Amotivation = -60 to 0, External regulation = 40 to 0, Introjected regulation to -20 to 0, Integrated regulation = 0 to 20, Identified regulation = 0 to 40, Intrinsic regulation = 0 to 60.

Paired samples t-tests from pre-post revealed significant increases in autonomy $t(13)=6.27$, $p<0.00$. Competence $t(13)=7.05$, $p<0.00$. Relatedness $t(13)=4.96$, $p<0.00$. There were significant decreases in more extrinsic regulation: amotivation $t(13)=2.49$, $p=0.03$, external regulation $t(13)=6.27$, $p=0.01$, Introjected regulation $t(13)=2.98$, $p<0.00$. There were significant increases in more intrinsic regulation identified regulation $t(13)=3.31$, $p=0.01$. Integrated regulation $t(13)=6.71$, $p<0.00$. Intrinsic regulation $t(13)=5.41$, $p<0.00$.

All 14 participants stated they enjoyed using Ring-Fit Adventure at the end of the intervention. Participant 4: *Oh it was a blast. Completely different than what I've done in the past for exercise.* It's also interesting that none of the participants reported owning a Nintendo Switch or Ring-Fit Adventure and many of them had reservations about playing a video game beforehand. Participant 2: *I was a little unsure of how I would do in this study, I don't really play video games. I was surprised at how much I actually liked playing the game.*

71% of subjects that completed the study also stated they either intended or wanted to purchase it for themselves to use after the study. Participant 6: *Yes, I've actually seen it in stores now and I do play on getting it in the next few weeks.* 29% of the participants specifically wanted to keep using the game to build off the progress made during the study. Participant 1: *The last thing I want to do now is stopped. I've come so far, I've got my routine now.*

36% of participants reported enjoying the ability to choose exercises, which may support the autonomy findings. Participant 11: *I really liked that I got to pick my exercises. Sometimes, I didn't want to do another arm exercise so I could pick something for my legs instead.* 29% of participants also reported enjoying the ability to add new exercises over time and add them to their list of exercises to use in-game. Participant 9: *Every time I started to get tired of doing certain exercises, I would get a new one that I wanted to use. That was a nice addition every now and then.*

93% of participants also felt confident that they would be able to complete Ring-Fit Adventure sessions at home in the future, which may support the competence findings. Participant 14: *Absolutely, everything I did here I could do at home.* 29% of participants also made statements revealing they felt improved in terms of exercise form after using the game. Participant 12: *I think I'm a lot better at squats now. I don't think I was doing them right before. The little game guy was showing me how to do it and I felt it a lot more in my legs.*

Discussion

Within this study, the participants had significant changes in all SDT-related constructs. No prior studies have investigated these constructs specifically with Ring-Fit Adventure™. Future studies are needed to validate these findings among larger and more diverse samples. It does echo previous studies that have pointed to a potential relationship between AVG's and SDT [9-12]. It would also prove useful that if a relationship does exist, whether there are certain aspects of AVG's may result in changes in SDT constructs.

The qualitative findings point to the participants enjoying their time with the game. There doesn't appear to be any literature examining the qualitative findings after using Ring-Fit Adventure™. There does seem to be a generally positive reception to AVG's in terms of enjoyment, which may present one of AVG's best attributes, mixing enjoyable gameplay with exercise [32-34]. It's also important to note that some of the qualitative findings may support the changes found in the SDT-related constructs. Participants enjoyed the ability to choose exercises, which may support the autonomy findings. The participants also felt confident that they would be able to complete Ring-Fit Adventure sessions at home in the future, which may support the competence findings. This methodology has not been utilized to support SDT findings, future studies would benefit the literature by doing so.

Limitations

The largest limitation of this intervention is the small sample size which confines the generalizations that can be made. The lack of a control group also limits the inferences that can be made regarding these results. In keeping in accordance with social distancing guidelines, we were limited on the number of participants and thus experimental conditions. Future interventions would benefit by focusing on increasing sample size and randomly assigning participants to experimental conditions. Although purposefully, this intervention was made up entirely of a female sample, which also limits generalizations. Future interventions may focus on adding male participants, and perhaps participants across the age span.

Conclusions

After completing 8 weeks of sessions using Ring-Fit Adventure, there were significant changes in all SDT-related variables. Participants enjoyed using this technology and the experiences with the game may support some of the SDT-related findings. Future studies should focus on increasing and diversifying the sample and determining the duration of the effect.

References

1. Mears D, Hansen L (2009) Active gaming: definitions, options and implementation. Article# 5 in a 6-part series. Strategies 23: 26-29.
2. Entertainment Software Association E (2021) Essential facts about the computer and video game industry.
3. Bhutani S, Cooper JA (2020) COVID-19 related home confinement in adults: Weight gain risks and opportunities. Obesity 28: 1576-1577. https://doi.org/10.1002/oby.22904
4. Ghosh A, Arora B, Gupta R, Anoop S, Misra A (2020) Effects of nationwide lockdown during COVID19 epidemic on lifestyle and other medical issues of patients with type-2 diabetes in north India. Diabetes Metab Syndr 14: 917-920. https://doi.org/10.1016/j.dsx.2020.05.044
5. He M, Xian Y, Lv X, He J, Ren Y (2020) Changes in body weight, physical activity, and lifestyle during the semi-lockdown period after the outbreak of covid-19 in China: an online survey. Disaster Med Public Health Prep 15: e23-e28. https://doi.org/10.1017/dmp.2020.237
6. Pellegrini M, Ponzo V, Rosato R, Scumaci E, Goitre I, et al. (2020) Changes in weight and nutritional habits in adults with obesity during the "lockdown" period caused by the COVID-19 virus emergency. Nutrients 12: 2016. https://doi.org/10.3390/nu12072016
7. Suire K (2021) Motivational interviewing for weight management among college students. Auburn University, United States.
8. Ryan R, Rigby S, Przybylski A (2006) The motivational pull of video games: A self-determination theory approach. Motiv Emot 30: 344-360. https://doi.org/10.1007/s11031-006-9051-8
9. Peng W, Lin H, Pfeiffer A, Winn B (2012) Need satisfaction supportive game features as motivational determinants: An experimental study of a self-determination theory guided exergame. Media Psychol 15: 175-196. https://doi.org/10.1080/15213269.2012.673850
10. Koulouris J, Jeffery Z, Best J, O'neill E, Lutteroth C (2020) Me vs. Super (wo) man: Effects of customization and identification in a VR exergame. Proc 2020 CHI Conf Human Fact Comp Syst 2020: 1-17. https://doi.org/10.1145/3313831.3376661
11. Zhao C, Zhao C, Li Y, Zhao M, Wang, et al. (2022) The effects of active video game exercise based on self-determination theory on physical fitness and cognitive function in older adults. J Clin Med 11: 3984. https://doi.org/10.3390/jcm11143984
12. Peng W, Pfeiffer A, Winn B, Lin H, Suton D (2015) A pilot randomized, controlled trial of an active video game physical activity intervention. Health Psychol 34: 1229. https://psycnet.apa.org/doi/10.1037/hea0000302
13. Nintendo (2022) Top selling title sales units Nintendo Wii.
14. Nintendo (2022) Top selling title sales units Nintendo Switch.
15. Comeras-Chueca C, Villalba-Heredia L, Pérez-Llera M, Lozano-Berges G, Marín-Puyalto J, et al. (2020) Assessment of active video games' energy expenditure in children with overweight and obesity and differences by gender. Int J Environ Res Public Health 17: 6714. https://doi.org/10.3390/ijerph17186714
16. Sato T, Shimizu K, Shiko Y, Kawasaki Y, Orita S, et al. (2021) Effects of Nintendo Ring Fit Adventure exergame on pain and psychological factors in patients with chronic low back pain. Games Health J 10: 158-164. https://doi.org/10.1089/g4h.2020.0180
17. World Health Organization (2021) Obesity and overweight. Geneva, Switzerland.
18. Garawin F, Devries K, Thorogood N, Uauy R (2014) Global differences between women and men in the prevalence of obesity: is there an association with gender inequality? Eur J Clin Nutr 68: 1101-1106. https://doi.org/10.1038/ejcn.2014.86
19. Guthold R, Stevens GA, Riley LM, Bull FC (2018) Worldwide trends in insufficient physical activity from 2001 to 2016: a pooled analysis of 358 population-based surveys with 1.9 million participants. Lancet Glob Health 6: 1077-1086. https://doi.org/10.1016/S2214-109X(18)30357-7
20. Markland D, Tobin V (2004) A modification to the behavioural regulation in exercise questionnaire to include an assessment of amotivation. J Sport Exercise Psychol 26: 191-196. https://doi.org/10.1123/jsep.26.2.191
21. Ryan RM, Deci EL (2000) Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. Am Psychol 55: 68-78. https://psycnet.apa.org/doi/10.1037/0003-066X.55.1.68
22. Cid L, Monteiro D, Teixeira D, Teques P, Alves S, et al. (2018) The behavioral regulation in exercise questionnaire (BREQ-3) Portuguese-version: evidence of reliability, validity and invariance across gender. Front 9: 1940. https://doi.org/10.3389/fpsyg.2018.01940
23. Wilson PM, Bengoechea EG (2010) The relatedness to others in physical activity scale: evidence for structural and criterion validity. J Appl Biobehav Res 15: 61-87. https://doi.org/10.1111/j.1751-9861.2010.00052.x
24. Vlachopoulos SP, Michailidou S (2006) Development and initial validation of a measure of autonomy, competence, and relatedness in exercise: The basic psychological needs in exercise scale. Meas Phys Educ Exerc Sci 10: 179-201. https://doi.org/10.1207/s15327841mpee1003_4
25. Schunk DH, Zimmerman BJ (2012) Motivation and self-regulated learning: Theory, research, and applications. Routledge, United States.
26. Vlachopoulos SP, Ntoumanis N, Smith AL (2010) The basic psychological needs in exercise scale: Translation and evidence for cross-cultural validity. Int J Sport Exerc Psychol 8: 394-412. https://doi.org/10.1080/1612197X.2010.9671960
27. Keppel G, Wickens TD (2004) Design and analysis: A researcher's handbook. (4th edtn). Pearson Prentice-Hall, New Jersey, United States.
28. Faul F, Erdfelder E, Lang AG, Buchner A (2007) G* Power 3: A flexible statistical power analysis program for the social, behavioral, and biomedical sciences. Behav Res Methods 39: 175-191. https://doi.org/10.3758/BF03193146
29. Smith JA, Fieldsend M (2021) Interpretative phenomenological analysis. American Psychological Association, United States. https://psycnet.apa.org/doi/10.1037/0000252-008
30. Atkinson L, Shaw RL, French DP (2016) Is pregnancy a teachable moment for diet and physical activity behaviour change? An interpretative phenomenological analysis of the experiences of women during their first pregnancy. Br J Health Psychol 21: 842-858. https://doi.org/10.1111/bjhp.12200
31. Pridgeon L, Grogan S (2012) Understanding exercise adherence and dropout: An interpretative phenomenological analysis of men and women's accounts of gym attendance and non-attendance. Qual Res Sport Exerc Health 4: 382-399. https://doi.org/10.1080/2159676X.2012.712984
32. LeBlanc AG, Chaput JP, McFarlane A, Colley RC, Thivel D, et al. (2013) Active video games and health indicators in children and youth: a systematic review. PloS one 8: e65351. https://doi.org/10.1371/journal.pone.0065351
33. Coknaz D, Mirzeoglu AD, Atasoy HI, Alkoy S, Coknaz H, et al. (2019) A digital movement in the world of inactive children: favourable outcomes of playing active video games in a pilot randomized trial. Eur J Pediatr 178: 1567-1576. https://doi.org/10.1007/s00431-019-03457-x
34. Klompstra L, Jaarsma T, Mårtensson J, Strömberg A (2017) Exergaming through the eyes of patients with heart failure: a qualitative content analysis study. Games Health J 6: 152-158. https://doi.org/10.1089/g4h.2016.0087