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Get Fit with Ring Fit Adventure: How does a Novel Active Video Game compare to a Traditional Exercise Protocol?

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Abstract

Introduction: The purpose of this study was to compare the results of Ring-Fit AdventureTM (RF) on body composition to a sprint interval training plus resistance training protocol (SIT+RT) among the same participants, with two years separating the interventions.

Methods: 11 participants completed a 30 session, SIT+RT in early 2019. The same 11 participants also completed a 16 session, RF intervention in early 2021. Body composition was compared between groups from pre-post.

Results: No significant interaction found with body fat percentage (BF%), F(1,20)=2.44, p=0.79, η2=0.06. A significant interaction was noted for Bone Mineral Density (BMD) F(1,20)=5.52, p=0.03, η2=0.21 between group. The RF group gained BMD (M=0.03 g/kg2) compared to no change in the SIT+RT group.

Conclusion: Despite the longer duration and higher frequency of doses of the SIT+sRT protocol, RF was comparable to SIT+RT.

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Introduction

Active Video Games (AVG's) provide a unique opportunity to merge a popular entertainment avenue with health benefits. With the impact COVID-19 on weight and physical activity, more avenues for physical activity at home are needed [1-5]. While popularity of AVG's have waned in the last decade, the recent release of Ring-Fit Adventure™ (RF) has rejuvenated the status of AVG's with a surge in popularity alongside the Nintendo Switch [6]. Uncertainty exists regarding the effectiveness of AVG's physiologically. According to a meta-analysis, AVG's were effective in increasing light-moderate physical activity and were comparable to traditional physical activities among young populations [7]. However, another meta-analysis found that AVG's had little impact on weight among younger populations [8]. Another review among youth and young adults found that while AVG's are a healthier alternative to sedentary behavior, the case for large impact on physical activity and body composition has yet to be made [9]. The literature points to mixed results and more updated versions of these games need to be investigated and compared to more traditional forms of exercise. Adult populations are often ignored in the literature as very few studies exist outside of short-term measures of energy expenditure [10,11]. Interventions are needed that investigate physiological impact to detail whether this mode of exercise can lead to improved health outcomes [11]. The purpose of this study was to compare the impact of RF versus a sprint interval training plus resistance training (SIT+RT) regimen on body composition amongst the same women, with two years separating the studies.

Methods

Participants

With this study, we had the unique opportunity to compare the same subjects participating in both interventions two years apart. Participants completed the SIT+RT training protocol in the Winter-Spring of 2019 and then completed the RF intervention in the spring of 2021. Both interventions were approved by the University Institutional Review Board for Research Involving Human Subjects and followed the standards set by the Declaration of Helsinki. Each participant read and signed a written informed consent and completed the Physical Activity Readiness Questionnaire (PAR-Q). Participants were recruited by word of mouth, e-mail, flyers, and social network blast 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. Table 1 displays demographic information at the baseline.

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

Variable	RF (*n*=11)	SIT+RF (*n*=11)
Age (yrs)	43.86 (9.79)	41.89 (9.81)
BMI kg/m^2	32.60 (9.67)	31.33 (10.28)
% White	72.7%	72.7%
% Black	18.2%	18.2%
% Asian	9.1%	9.1%

BMI=Body Mass Index, RF=Ring-Fit Adventure, SIT+RT=Sprint Interval Training and Resistance Training

Body composition

The iDexa was utilized to measure body composition (BF% and BMD) of participants in a fasted state (no nutritional intake for the prior eight hours) by trained personnel. iDexa measures body composition and bone density by dual energy X-ray absorptiometry which provides accurate data regarding body composition [12,13].

SIT+RT

The SIT+RT group attended 10 weeks of exercise training for 30 sessions, all lasting one hour. The SIT+RT running protocol consisted of two (first 5 weeks) to three (last 5 weeks) sets of three 40 second sprints. This included 20 seconds of passive recovery between each sprint and one additional minute of recovery after each set. Two different resistance training protocols were utilized and alternated throughout the study; denoted as protocol A and protocol B. Protocol A consisted of back squat, bench press, and bent-over row. Protocol B consisted of squat jumps, walking lunges, standing shoulder press, and back extensions. Both protocols ended with abdominal exercises, followed by stretching. The order of the training model utilized in this study was: two week of conditioning, two weeks of hypertrophy, and two weeks of muscular strength, two weeks of hypertrophy, and two weeks of muscular strength.

RF

The RF protocol included eight weeks of sessions occurring twice per week, totaling 16 sessions. Each appointment lasted 45 minutes with the inclusion of a warm-up and a cool-down led by the in-game RF avatar lasting about 4-5 minutes each. Participants were then guided through a course requiring them to jog/run with the addition of physical challenges involving the use of the resistance ring. These challenges consisted of upper-body, lower-body, and core exercises using the resistance ring.

Data Analysis

Mixed ANOVAs assessed for statistically significant differences in variables. Although the sample size under analysis was smaller than is typically expected in an ANOVA design, it was still the appropriate choice as the model's statistical assumptions were met [14,15].

Results

Table 2 displays mean scores for pre- and post-testing variables.

Table 2: RF *vs*. SIT+RT Mean scores (standard deviations) by treatment condition.

Variable	RF Pre	RF Post	SIT+RT Pre	SIT+RT Post	*p*	Effect size (η_p^2)
BF%	44.75 (6.90)	43.60 (7.64)	44.27 (7.34)	43.01 (7.50)	0.79	0.06
BMD	1.21 (0.19)	1.24 (0.19)	1.23 (0.19)	1.23 (0.20)	0.03*	0.21

RF=Ring-Fit Adventure, SIT+RT=Sprint Interval Training and Resistance Training, BF%=Body Fat Percentage, BMD=Bone Mineral Density, * Denotes a significant difference.

There was no significant interaction found with BF%, $F(1,20)=2.44$, $p=0.79$, $\eta^2=0.06$ between group from pre to post. A significant interaction was noted for BMD $F(1,20)=5.52$, $p=0.03$, $\eta^2=0.21$ by group by time. The RF group gained BMD ($M=0.03$ g/kg^2) compared to no change in the SIT+RT group.

Discussion

These results establish strong potential of RF for body composition among women, even after limited use. When compared to a much more intensive SIT+RT protocol, there were no significant differences in BF%. Only three studies were identified that examined changes in body composition among adults playing AVG's. Bock et al., conducted a three-arm RCT, 12-week, 3 day/week with 50 minutes of game play among middle aged adults (79% females) and found a significant reduction in body fat% for AVG compared to a control group [16]. Owens SG, et al. (2011) [17], (9 adults, 3 months, at home use (no directive)) found a non-significant decrease (0.2%) in body fat% utilizing bioelectrical impendence [17]. Warburton DE, et al. (2007) [18], conducted a six-week, three-day/week, 30 minutes per session AVG study among 14 (*n*=7 AVG, *n*=7 control) college males. Utilizing bioelectrical impendence, the results showed a 1kg reduction in fat mass and no change in lean mass, resulting in no significant changes in body fat percentage [18]. While it is difficult to draw conclusions based on these limited findings, our results show RF impacts BF% in a more positive manner compared to previous studies in the literature with a reduction of 1.15%. This is also the first intervention, to our knowledge, that has compared an AVG and a traditional exercise protocol and the differences of effect on BMD. While these results showed the RF intervention had significant improvement compared to SIT+RT, due to the low sample size, much more research is needed to validate these findings.

Limitations

The largest limitation with this research is the small sample size which confines the generalizations that can be made. Although purposefully, this intervention was made up entirely of a female sample, which also limits generalizations. Another limitation was the lack of measurement for physical activity and nutrition outside of the intervention. While we asked the participants to maintain their current eating habits and physical activity levels outside of the study, it cannot be ruled out that potential changes in habit influenced the results.

Conclusion

There was no significant difference in BF% among the same participants two years apart after completing SIT+RT and RF interventions. There was a significant difference in BMD, with the RF group having an increase compared to no change in the SIT+RT group. Despite the longer duration and higher frequency of doses of the SIT+RT protocol, RF was comparable in terms of body composition. This may be applicable to health professionals looking for a recommendation for an at-home workout option. To support these findings, future studies should also focus on increasing and diversifying the sample, increasing the duration of the study, and conducting interventions within the home setting to determine adherence outside of a laboratory.

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