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Energy Expenditure and Enjoyment during Video Game Play: Differences by Game Type

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Abstract

Purpose—Play of physically active video games may be a way to increase physical activity and/or decrease sedentary behavior, but games are not universally active or enjoyable. Active games may differ from traditional games on important attributes, which may affect frequency and intensity of play. The purpose of this study was to investigate differences in energy expenditure and enjoyment across four game types: shooter (played with traditional controllers), band simulation (guitar or drum controller), dance simulation (dance mat controller), and fitness (balance board controller).

Methods—Energy expenditure (metabolic equivalents [METs]) and enjoyment were measured across ten games in 100 young adults aged 18 to 35 (50 females).

Results—All games except shooter games significantly increased energy expenditure over rest ($P < .001$). Fitness and dance games increased energy expenditure by 322 (mean [SD] 3.10 [0.89] METs) and 298 (2.91 [0.87] METs) percent, which was greater than that produced by band simulation (73%, 1.28 [0.28] METs) and shooter games (23%, 0.91 [0.16] METs). However, enjoyment was higher in band simulation games than in other types ($P < .001$). Body mass-corrected energy expenditure was greater in normal weight than overweight participants in the two most active game types ($P < .001$).

Conclusions—Active video games can significantly increase energy expended during screen time, but these games are less enjoyable than other more sedentary games, suggesting that they may be less likely to be played over time. Less active but more enjoyable video games may be a promising method for decreasing sedentary behavior.

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Keywords

Young adults; Indirect calorimetry; Electronic games; Overweight; Gender differences

INTRODUCTION

Screen time, or time spent in front of a television or computer screen, is a prevalent sedentary behavior; American adults spend more time watching television (two to three hours per day) than any other activity besides working or sleeping (37). Sedentary screen time has been shown to be associated with obesity (15, 34) as well as negative health outcomes such as premature death (3, 21) independently of physical activity levels (13).

One strategy for decreasing sedentary behavior may be to increase energy expended during screen time by replacing television watching and/or sedentary video gaming with active video game play. The term “active video game” or “exergame” has been used to describe games in which body movement is necessary or encouraged by the control scheme of the game. Typically, active games use motion-sensing or motion-encouraging controller rather than a traditional hand-held gamepad controller. These controllers may take the form of mats, boards, motion-sensing cameras, or hand-held motion sensing devices.

Laboratory studies of active games have found significant energy expenditure increases over rest. Most games that have attracted research attention have produced moderate-intensity activity (8, 18, 19), though some produced light (9) or vigorous levels (32). Unfortunately, published studies thus far have been hampered by methodological limitations. Nearly all have used small sample sizes ($N < 25$) of mostly male youths comparing few games. Energy expenditure estimates have ranged widely even in nearly identical games. For example, estimates range between 3.5 and 7.2 metabolic equivalents (METs) for dance simulation games (18, 19, 32, 35, 38); the reasons for these differences are unclear. Psychological reactions have rarely been measured and have not been used to compare active to traditional games.

In addition, most existing studies have sampled child populations, but active gaming is particularly attractive for young adults. In fact, 75% of gamers are adults, most (49%) between 18 and 49 years old (4). As individuals move from adolescence to adulthood, their physical activity declines (7), and this effect is particularly pronounced in adolescent gamers (24). Young adults (18–35) experience a large weight gain during this period, averaging 1 to 2 pounds per year (36), or 30 pounds by age 35. It has been estimated that even small changes in energy balance of approximately 100 calories per day could prevent weight gain (14); thus, substituting more active pursuits for sedentary time might be an effective strategy for maintaining healthy weight in this age group.

Though active gaming holds promise for intervention in this population, it is not without potential problems. In order to replace a sedentary behavior with a more active alternative, the alternative must be equally or more reinforcing than the original behavior (5). If video games are to serve as a healthier alternative to sedentary screen time, they must be reinforcing enough to be chosen over sedentary gaming or TV watching. Preliminary evidence indicates that in interventions using active gaming, participation and play decline over time, perhaps due to a loss of interest (1, 20). Active games themed around dancing or fitness lack many characteristics commonly found in the most popular traditional games that are associated with enjoyment and engagement, such as high-quality graphics (2) and a storyline (31). There is a need for research to determine whether active games are as enjoyable as other, more sedentary activities such as playing traditional video games.

Positive affective judgments such as intrinsic motivation and enjoyment have been found to be one of the most powerful predictors of physical activity over time (28). Several studies have found that enjoyment and positive affect predict subsequent play of sedentary video games (27, 30) and stationary cycling while playing a video game (29). Active video games and traditional games played during stationary cycling have been found to be more enjoyable than traditional exercise (10) and to produce greater adherence (40), but it is unknown how active games compare to other types of games.

The purpose of this study was to investigate physiological and psychological reactions to several popular video game types that represent a range of hypothesized activity levels. Traditional shooter games, instrument-based band simulation games, dance simulation games, and fitness games were compared to determine whether they differed in enjoyment and/or energy expended during play. It was hypothesized that shooter and band simulation games would produce higher levels of enjoyment but lower levels of energy expenditure, while dance simulation and fitness games would produce the opposite pattern.

METHODS

Sample

One-hundred 18–35 year old adults, equal numbers male and female, were recruited using a university online mailing list and television advertisements. To be included, participants were required to weigh < 300 pounds (a requirement for one of the controllers), have played video games at least three times over the past year, have transportation to the study site, and be willing to be videotaped and fast at least two and one half hours prior to their appointment. Of 757 individuals who requested information and eligibility criteria, 325 completed eligibility information; of those 325, 169 potential participants were scheduled, and 100 completed the protocol. Eligible participants who did not attend their appointments ($N = 49$) were considered drop-outs, and 156 eligible participants were wait-listed. This study was powered to detect differences of 0.72 METs in energy expenditure, which was based on previously published estimates of differences in game types (39).

Games and Procedure

The study was conducted in a dedicated lab in a university-owned office building between April and August of 2009. The room included a 58" high definition television, game chair with surround sound speakers, and measurement equipment. Participants arrived after fasting two and one half hours, provided written informed consent, and anthropometric (height, weight) and questionnaire measures were taken. The face mask for the Ultima CPX indirect calorimetry device (Medgraphics, Inc., St. Paul, MN) was then fitted, adjusted, and tested as needed prior to a 20 minute rest period. Games were played in randomized order for 13 minutes each, with the first three minutes considered a training period. The order in which games were played did not affect psychological or physiological reactions; no significant differences in energy expenditure or enjoyment were found by game order (data not reported). During the training period, the study coordinator provided game instructions as well as a visual aid showing controller functions. Psychological variables were measured by questionnaire at the conclusion of each game. Participants rested five to ten minutes between games to allow heart rates to return to within a standard deviation of baseline levels (approximately 10–15 beats/minute). During rest periods, masks were removed and water provided. Snacks were available immediately upon completion of study protocol. The protocol lasted approximately four hours per participant and was approved by the University of North Carolina at Chapel Hill Public Health-Nursing Institutional Review Board.

This within-subjects investigation tested four game types: shooter, band simulation, dance simulation, and fitness. Where more than one game of each type was played, estimates were averaged. Games were chosen purposefully to represent popular game franchises and genres as well as common controllers and consoles. Medal of Honor, Resident Evil, Guitar Hero, Rock Band, and Wii Fit are among the best-selling game franchises of all time (see vgchartz.com for sales data). The Dance Dance Revolution franchise, though less popular, has been widely studied in the literature and thus was included.

Each participant played three shooter games using a traditional gamepad controller (50 participants) or Wiimote (50 participants). Participants were randomized to play *Medal of Honor: Airborne*, *Resident Evil 4*, and *Resident Evil* in the gamepad group and *Medal of Honor: Heroes 2*, *Resident Evil 4: Wii Edition*, and *Resident Evil: The Umbrella Chronicles* in the Wiimote group. All shooter games were played on a Sony Playstation 3 or Nintendo Wii console. Estimates were averaged across the three games and two groups. Neither energy expenditure nor enjoyment differed by console (data not reported).

The two band simulation games were *Guitar Hero III: Legends of Rock* and *Rock Band 2*. For Guitar Hero, participants played along with on-screen prompts on a plastic guitar controller. For Rock Band, participants used drumsticks to hit pads on a drum set controller. The dance simulation game was *Dance Dance Revolution: Universe 2*. Participants stepped on arrows on a mat controller as prompted by arrows appearing on the screen. All three music games were played on a Microsoft Xbox 360 console. For each music game, all participants played the same song on the easiest difficulty level before choosing their preferred songs and difficulty.

The fitness game used was *Wii Fit*, played on a Nintendo Wii console using Wiimote and Balance Board controllers. The Wiimote used player arm movement as a game input. Players stood on the Balance Board, which used shifts in weight distribution as game inputs. *Wii Fit* is made up of different minigames. Pilot testing showed that minigame categories (aerobic, balance, yoga, and strength) differed in activity intensity. To represent the widest range of possible activities, participants were randomized to play two minigames (one balance, one aerobic) out of four possibilities. Half of the sample played the jogging and penguin slide minigames, and half played the hula hoop and skiing minigames.

Measurement

Energy expenditure was measured via indirect calorimetry (Ultima CPX, Medgraphics, St. Paul, MN) using a neoprene mask and open pneumotach. The calorimeter was calibrated daily using a three liter syringe as well as prior to each test using certified gases. The umbilical hose connecting participants to the metabolic cart was routed behind each participant's body and was sufficiently long to allow movements required for each game. Height and weight were measured in light street clothes without shoes using a wall-mounted stadiometer (Perspective Enterprises, Inc., Kalamazoo, MI) and calibrated scale (Tanita, Arlington Heights, IL).

The interest/enjoyment subscale of the Intrinsic Motivation Inventory was used to measure enjoyment (22). Participants ranked their agreement with each statement on a Likert scale of one (not at all true) to seven (very true). Slight changes to wording were made to reference video game playing. Items included "I thought this game was quite enjoyable." Responses were averaged to create the intrinsic motivation score (range: 1 – 7). Descriptive characteristics were measured using individual items for each variable (e.g., "how much experience do you have playing video games?" on a scale of one to seven). Questions on sedentary television watching and video gaming were adapted from the National Health and Nutrition Examination Survey (6).

Data analysis

Energy expenditure estimates were averaged over the last 10 minutes of play (excluding the three-minute training). Resting energy expenditure was taken from the final five minutes of the rest period. Definitions and cut-points for sedentary behavior and light, moderate, and vigorous intensity activity were taken from Pate, O'Neill, and Lobelo (25).

To investigate differences across game types, two mixed models were created using intrinsic motivation and energy expenditure as dependent variables and game type as the repeated measure. Degrees of freedom were calculated using the Kenward-Roger method (16). Because several studies of energy expenditure during video game play found differences by gender and weight status (lean or overweight) (9, 38), these variables as well as interaction terms were also included. Non-significant interactions were removed from final reported models. For the energy expenditure analysis, five levels of the game variable were included (rest, shooter, band simulation, dance simulation, fitness game). For motivation, only the four game types were included. To investigate interactions, contrasts with Tukey-Kramer corrections were used. All analyses were performed using SAS statistical software version 9.2 (SAS, Cary, NC).

RESULTS

Participant characteristics are found in Table 1. Males and females differed significantly in height and weight, but not in BMI or other personal characteristics. Seventy-three percent of participants were white, 15% black, 8% Asian, and 4% other. Six percent were of Hispanic ethnicity. Most were college graduates (49%) or had some college education (32%). A slight majority (55%) were overweight. Participants rated themselves an average of 5.85 in video game experience on a scale of one (not a lot) to seven (a lot), indicating that they were experienced gamers. In fact, nearly all were quite experienced; only four individuals of the 100 reported less than “some” (four on the seven-point scale) experience. Participants reported approximately three hours per day spent watching television and two hours per day spent playing video games. Time spent gaming was significantly higher in males than in females ($P < .001$).

Energy Expenditure

Energy expenditure differed significantly across game type ($P < .001$; Table 2; Figure 1). Weight status moderated the effect of game type on energy expenditure ($P = .019$) such that non-overweight participants expended more energy than overweight participants during the dance simulation game (mean difference 0.53 METs, 95% confidence interval [CI] 0.18–0.89, $P < .001$) and fitness game (0.40 METs, 95% CI 0.04–0.76, $P = .017$) (Figure 2). No significant differences by weight status were found for the other games ($P > .09$). Gender was not a significant predictor of energy expenditure ($P = .204$).

Energy expenditure during shooter games did not differ significantly from rest ($P = .261$). Band simulation games produced a mean difference of 0.38 METs (95% CI 0.18–0.57) greater energy expenditure than shooters and 0.52 METs (95% CI 0.32–0.71) greater energy expenditure than rest ($P < .001$). Dance simulation games produced energy expenditure 2.16 METs (95% CI 1.97–2.36) greater than rest, 2.02 METs (95% CI 1.82–2.21) greater than shooters, and 1.64 METs (95% CI 1.45–1.84) greater than band simulation games (all $P < .001$). Fitness games produced energy expenditure 2.34 METs (95% CI 2.15–2.53) greater than rest, 2.20 METs (95% CI 2.00–2.39) greater than shooters, and 1.82 METs (95% CI 1.63–2.02) greater than band simulation games (all $P < .001$). Though the dance simulation game and fitness game did not differ significantly, the mean difference in energy

expenditure showed a trend towards lower energy expenditure in the dance simulation game (mean difference -0.18 METs, 95% CI -0.37 – 0.01 , $P = .086$).

Enjoyment

Enjoyment also differed across game type ($P < .001$), and gender moderated the relationship between game type and enjoyment ($P < .001$; Table 3). Non-overweight participants found the games less enjoyable than overweight participants, $B(SE) = -0.31(0.14)$, $P = .032$. The main effect of gender was not significant ($P = .517$). Figure 1 shows differences by game type in the pattern of results for energy expenditure and enjoyment.

Tests of mean differences across game types revealed several significant differences as well as different patterns of enjoyment for each gender. Both genders rated band simulation games as more enjoyable than shooters (females: mean difference 2.41 , 95% CI 1.70 – 3.12 ; males: 1.20 , 95% CI 0.49 – 1.91), dance simulation (females: 0.85 , 95% CI 0.14 – 1.56 ; males: 1.48 , 95% CI 0.77 – 2.18), and fitness (females: 1.71 , 95% CI 1.00 – 2.42 ; males: 1.83 , 95% CI 1.12 – 2.54) games (all $P < .001$). Females rated dance simulation games as significantly more motivating than shooter (1.56 , 95% CI 0.85 – 2.27 , $P < .001$) and fitness (0.86 , 95% CI 0.15 – 1.56 , $P = .007$) games, whereas in males there was no difference between dance simulation games and the other two types (shooter: -0.27 , 95% CI -0.98 – 0.44 ; fitness: 0.36 , 95% CI -0.35 – 1.07 ; $P > .60$). The fitness and shooter games were ranked similarly by males (-0.63 , 95% CI -1.33 – 0.08 , $P = .126$), but in females a trend toward ranking the fitness game higher than shooters was found (0.71 , 95% CI 0.00 – 1.41 , $P = .052$).

DISCUSSION

Energy expenditure and enjoyment differ across types of video games; here, we found that the more active games were not as enjoyable as band simulation games, which were not physically active. On average, the games studied here produced an increase in energy expenditure over rest of 23% for shooter, 73% for band simulation, 298% for dance simulation, and 322% for fitness games. Overweight participants expended less energy (corrected for body mass) in the two most active games but found all games more enjoyable than non-overweight participants. Band simulation games were rated as most enjoyable, with scores 25% to 45% higher than the other games, but did not produce moderate levels of physical activity.

Energy expenditure estimates for these games, ranging between 0.91 and 3.10 METs, were similar to several other published studies of active gaming in adults. One study of Wii Fit ($N = 12$) reported energy expenditure between 2.0 and 3.4 METs for minigames used here (23), while another of Wii Sports Boxing ($N = 20$) reported energy expenditure 2.67 METs (17). Resting rates were also very similar to those found in other studies of adults (17). Several studies of dance simulation games found energy expenditure higher than our estimate of 2.91 METs, but those studies mostly sampled children (18, 19, 33, 38), who have been found to expend more energy than adults during active video game play (17). Energy expenditure found here may also have been lower due to lack of experience and/or skill in this sample: more than half of the sample (67%) played on “beginner,” the easiest difficulty level.

The energy expenditure found in the dance simulation and fitness games was approximately equivalent to moderate intensity physical activity. However, these two active game types were rated as less enjoyable than band simulation games. Because positive affective judgments such as enjoyment predict physical activity and video game play (26, 28), young adults may be less likely to play the games that could provide the greatest fitness improvements, instead favoring games that are less strenuous. Active gaming may be more

enjoyable than traditional physical activity for some populations, but it appears unlikely that these games will be reinforcing enough to replace sedentary gaming in young adults. Future studies could compare enjoyment of active gaming to traditional forms of physical activity.

The most enjoyable games, band simulation games, did not produce light or moderate intensity physical activity levels in this study. However, replacement of television watching with play of these games may be a tactic for reducing sedentary behavior. Light intensity activity and sedentary behavior have been shown to be predictors of obesity independent of moderate-vigorous activity (11); in fact, there is evidence that replacing sedentary time with even brief periods of light physical activity would be beneficial to health (12). If these games could be made slightly more strenuous (approximately 0.22 METs or greater increase), they have the potential for a broad public health impact. It should be noted that estimates for guitar and drum play were averaged here, and that players were allowed to sit or stand as they pleased while playing guitar (51 participants chose to stand; both standing and sitting guitar play were sedentary). Future in-depth analyses of these data may identify styles of play associated with greater activity intensity in these games.

Non-overweight players expended more energy (corrected for body mass) in the most active games than overweight players. In fact, overweight participants in this study did not engage in moderate intensity physical activity (> 3 METs) in any game. The reasons for this difference are unclear, but do not appear to be based on lesser enjoyment. In fact, overweight participants found all of the studied games more enjoyable than did non-overweight participants. It is possible that overweight players may play for longer durations since they enjoyed these games more, leading to similar or greater energy expenditure than non-overweight players over time. It should be noted that the overweight category in this study includes obese individuals, as participants were dichotomized into only two groups. Comparisons that further investigate weight differences by comparing normal weight, overweight, and obese individuals may provide greater insight into these differences. Additionally, further studies may provide insight into possible reasons why overweight individuals may be less active when playing some game types.

No differences were found by gender on energy expenditure; however, males and females showed different patterns of enjoyment across the four game types. Participants of both genders rated band simulation games as the most enjoyable. Males found the other three types to be equally enjoyable. Women, however, found the dance simulation game more enjoyable than shooters or the fitness game. The relatively low scores for shooter games, which sell extremely well, were surprising. It is possible that shooters appeal primarily to a younger, male audience that was not represented in this study; it is also possible that the shooters used in this study were not representative of current trends in shooter games that have produced blockbuster sales (i.e., modern warfare rather than a World War II setting and online multiplayer matches rather than single player campaign play).

This study had several strengths: it was the largest laboratory study of active video games to date and included a sample large enough to explore moderating variables of gender and weight status. A wide variety of popular games were tested, including both traditional and potentially active games. Beyond measurement of energy expenditure, enjoyment was also measured, providing insight into differences in motivating characteristics across games. Despite these strengths, there were also limitations due to the cross-sectional nature of the data. While these results may have implications for physical activity accumulation, longitudinal studies will be necessary to investigate the relationship between enjoyment and play over time in active video games. Additionally, each game was only played for 10 minutes, with a three minute training period. Though these time periods are standard in the active video game literature thus far, a longer play period may be more generalizable to

typical play. It is possible that reactions to these games change as time spent playing them increases.

Conclusions

Video games vary in how much activity they produce and in how much they are enjoyed. Dance simulation and fitness games appear to have potential to produce moderate intensity physical activity, but these types of games appear less enjoyable than more sedentary band simulation games; thus, attempts to replace sedentary gaming with active gaming may not be successful long term due to differences in enjoyment. Overweight individuals enjoyed all the games more than normal weight individuals, which may have implications for reducing sedentary behavior in this population. Though band simulation games did not produce light or moderate intensity physical activity, they may hold potential for intervention due to their enjoyable characteristics. Further study of enjoyable game characteristics could improve future active games and increase the potential for video games to contribute to energy expenditure. Long-term randomized controlled trials are necessary to determine whether active games can be implemented and maintained as effective physical activity and/or sedentary behavior interventions.

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Figure 1. Patterns of energy expenditure and enjoyment differences by game type
IMI, Intrinsic Motivation Inventory; Band, band simulation; Dance, dance simulation For energy expenditure, all game types except dance simulation and fitness differed significantly from one another ($P < .001$); for enjoyment, band simulation games were rated significantly higher than all other game types ($P < .001$). Error bars are standard deviations

Figure 2. Energy expenditure across games by weight status

*Significant difference by weight status, $P < .001$; Error bars are standard deviations

Table 1

Participant characteristics by gender and weight status, mean (SD)

Characteristic	Male			Female			Total
	Overwt (N = 30)	Non-Overwt (N = 20)	All Male (N = 50)	Overwt (N = 25)	Non-Overwt (N = 25)	All Female (N = 50)	
Age	25.00 (4.90)	22.75 (2.69)	23.96 (4.25)	25.00 (3.99)	22.12 (2.74)	23.56 (3.69)	23.76 (3.96)
Weight (kg)	96.57 (16.11)	73.66 (8.77)	87.40* (17.66)	87.46 (21.43)	59.35 (6.42)	73.40* (21.13)	80.40 (20.62)
Height (cm)	179.47 (7.38)	179.52 (6.74)	179.49* (7.06)	165.67 (7.32)	164.88 (5.37)	165.27* (6.37)	172.03 (10.26)
BMI (kg/m ²)	30.55 (5.60)	22.81 (1.87)	27.45 (5.88)	31.76 (7.05)	21.80 (1.73)	26.78 (7.15)	27.12 (6.52)
Video game experience	6.73 (0.52)	6.30 (1.03)	6.56* (0.79)	5.16 (1.31)	5.08 (1.28)	5.12* (1.29)	5.84 (1.28)
Television watching (hours/day)	3.38 (1.53)	3.18 (1.91)	3.30 (1.68)	2.98 (1.58)	2.28 (1.65)	2.63 (1.64)	2.97 (1.68)
Video gaming (hours/day)	2.97 (1.92)	2.50 (1.92)	2.78* (1.92)	1.38 (1.42)	1.14 (1.30)	1.26* (1.36)	2.01 (1.82)

Overwt, overweight; non-overwt, non-overweight; kcal, kilocalorie

* Gender difference, $P < .05$

Table 2

Energy expenditure (METs) by game type, gender, and weight status, mean (SD)

	Male			Female			Totals		
	Overwt (N = 30)	Non-Overwt (N = 20)	Total (N = 50)	Overwt (N = 25)	Non-Overwt (N = 25)	Total (N = 50)	Overwt (N = 55)	Non-Overwt (N = 45)	Overall (N = 100)
Rest	0.72 (0.79)	0.89 (0.15)	0.79 (0.18)	0.67 (0.14)	0.83 (0.16)	0.74 (0.17)	0.70 (0.16)	0.86 (0.16)	0.77 (0.18)
Shooter	0.86 (0.15)	0.96 (0.14)	0.91 (0.16)	0.84 (0.15)	1.00 (0.16)	0.92 (0.17)	0.85 (0.15)	0.98 (0.16)	0.91 (0.16)
Band	1.29 (0.29)	1.45 (0.23)	1.35 (0.28)	1.08 (0.19)	1.34 (0.26)	1.21 (0.26)	1.20 (0.27)	1.39 (0.25)	1.28*† (0.28)
Dance	2.69 (0.86)	3.31 (1.22)	2.93 (1.05)	2.72 (0.65)	3.05 (0.63)	2.88 (0.65)	2.70§ (0.76)	3.17§ (0.93)	2.91*†‡ (0.87)
Fitness	3.01 (0.97)	3.35 (1.13)	3.15 (1.04)	2.82 (0.62)	3.28 (0.73)	3.05 (0.71)	2.92§ (0.83)	3.31§ (0.92)	3.10*†‡ (0.89)

Overwt, overweight; Non-overwt, non-overweight

* Significantly higher than rest, $P < .001$

† Significantly higher than shooters, $P < .001$

‡ Significantly higher than band simulation, $P < .001$

§ Difference by weight status, $P < .017$

Table 3

Enjoyment by game type, gender, and weight status, mean (SD)

	Male		Female		Totals	
	Overwt (N = 30)	Non-Overwt (N = 20)	Total (N = 50)	Overwt (N = 25)	Non-Overwt (N = 25)	Overall (N = 100)
Shooter	4.81 (0.92)	4.44 (0.97)	4.67 (0.95)	3.71 (1.28)	3.19 (0.84)	3.45 (1.10)
Band	6.05 (0.60)	5.61 (0.81)	5.87*†‡ (0.72)	6.14 (0.92)	5.59 (1.16)	5.86*†‡ (1.07)
Dance	4.50 (1.82)	4.24 (1.40)	4.39 (1.66)	5.14 (1.31)	4.88 (1.52)	5.01*§ (1.41)
Fitness	4.15 (1.34)	3.86 (1.55)	4.04 (1.42)	4.06 (1.54)	4.25 (1.10)	4.16 (1.33)
Overwt, overweight; non-overwt, non-overweight						
* Significantly higher than shooter games, $P < .001$						
† Significantly higher than dance simulation game, $P < .001$						
‡ Significantly higher than fitness game, $P < .001$						
§ Significantly higher than the fitness game, $P < .007$						