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CHAPTER 2

Active and non-active video gaming among Dutch adolescents: Who plays and how much?

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Abstract

Objective

The aim of study was to determine prevalence and identify demographic correlates of active and non-active gaming among adolescents.

Design

Cross-sectional.

Methods

A survey, assessing game behavior and correlates, was conducted among adolescents (12–16 years, $n=373$), recruited via schools. Multivariable logistic regression analyses were conducted to examine demographic correlates of active gaming (≥ 1 h per week) and non-active gaming (>7 h per week).

Results

Of all participants ($n=373$), 3% reported to play exclusively active games, 40% active games and non-active games, 40% exclusively non-active games, and 17% not playing video games at all. Active gaming adolescents played active games on average on 1.5 ($sd=1.2$) days per school week for 36 ($sd=32.9$) min and 1 ($sd=0.54$) day per weekend for 42 ($sd=36.5$) min. Non-active gaming adolescents played on average on 3.3 ($sd=1.6$) days per school week for 65 ($sd=46.0$) min and 1.4 ($sd=0.65$) days per weekend for 80 ($sd=50.8$) min. Adolescents attending lower levels of education were more likely to play active games ≥ 1 h per week than adolescents attending higher educational levels. Boys and older adolescents were more likely to play non-active games >7 h per week, than girls or younger adolescents.

Conclusions

Many adolescents play active games, especially those following a lower educational level, but time spent in this activity is relatively low compared to non-active gaming. To be feasible as a public health strategy, active gaming interventions should achieve more time is spent on active gaming at the expense of non-active gaming.

Introduction

Regular physical activity (PA) of at least moderate intensity is part of a healthy lifestyle and associated with better health outcomes in all age groups [1;2]. However, a decrease in PA is observed during adolescence [3]. Independent of PA, sedentary behaviors (e.g. watching TV and playing video games) have been associated with overweight [4] and potentially fitness [5]. Both increasing PA and reducing sedentary time are therefore key public health targets [6, 7].

Number of studies have shown that video games contribute significantly to sedentary time of adolescents [8-10]. Rideout et al. showed that on any given day a majority (60%) of children play sedentary video games (hereafter called non-active games), for a considerable time, i.e. almost 2 h/day [8]. In the Netherlands 95% of the 13-19 years old boys and 85% of the girls play video games and spend on average 10 and 4h per week, respectively [9]. A new generation of video games, called active games (e.g. Xbox 360 Kinect, PlayStation®Move, and Nintendo Wii™), require PA [11] to play and might therefore contribute to both reducing sedentary time and increasing PA [12]. Active games elicit energy expenditure of 2-6 Metabolic Equivalents (METs), which is higher than non-active games and other sedentary activities [12]. Therefore, playing active games instead of non-active ones may be a promising strategy for promoting an active lifestyle and improving body composition [13].

Many studies have focused on prevalence of non-active gaming and showed that non-active gaming is associated with multiple demographic characteristics [8;10;14]. One of the most consistent results is boys spending more time in non-active gaming than girls [8;10;14]. Next, age, ethnicity and parents' educational level have been identified as correlates of non-active gaming; 11-14 years-olds play more than 8-10 years-olds [8], Hispanic and African American youth (8-18 years-old) spend more time gaming than Caucasian youth [8] and children from parents with low or medium education levels spend more time gaming than children of higher educated parents [14;15].

Although multiple studies explored prevalence and demographic correlates of non-active gaming, this information seems to be lacking for active gaming. To date only two studies focused on prevalence and correlates of active gaming, showing mixed results [16;17]. A Canadian study showed that 25% of Canadian adolescents played active games and they were more likely to be female, play non-active video games, watch ≥ 2 h of television per day, be concerned about weight, and be non-smokers. A Dutch study showed that regular active gamers (≥ 1 h per week) were significantly younger than non-regular active gamers (< 1 h per week) (13.5 versus 14.1 years) but showed no differences in gender, educational level (of adolescent and parent), ethnicity or sedentary behavior (TV/DVD and computer time) between regular active gamers (≥ 1 h per week) and non-regular active gamers (< 1 h per week) [17]. To our knowledge, no information is available on with

whom and where adolescents play active games. This information will give insight into to what degree active gaming is a social activity, which is of importance because of the shown association with long term use [18;19]. Additionally, so far no studies have been conducted on prevalence and correlates of active gaming and non-active gaming simultaneously. Therefore, it remains unknown whether any differences exist between those who prefer playing video games in an active mode, or those who mainly play non-active games. Such information is of importance to provide insight into reach and feasibility of active games as a health promotion tool and can help intervention developers with designing active game interventions.

The aims of the current study were to (1) explore to which game consoles/applications adolescents have access to in their home; (2) evaluate the prevalence and time spent in active and non-active gaming; (3) explore active and non-active game locations and companions; and (4) examine demographic correlates of active and non-active gaming.

Methods

The present study reports data from two surveys assessed one month apart. There was no intervention delivered to participants between the administration of the two surveys. The present study reports cross-sectional data from the first questionnaire completed by adolescents. Only some unchangeable factors (country of birth, game companions and locations and access to consoles/applications were derived from the time 2 questionnaire (T2).

The Dutch secondary school system consists of three levels of education: (1) pre-vocational, (2) higher continued education, and (3) pre-university. Adolescents were recruited from five secondary schools of covering all educational levels and geographic diversity aiming to include a sample comparable to the Dutch adolescent population at large. In each participating school, between four and six classes of students in the first to fourth year of secondary school (i.e. age 12–16 years old) were invited to participate. All adolescents willing to participate completed a questionnaire in class. Hereafter, they received a letter for their parents explaining the study. If parents had objections against their child participating in the survey, they could fill in the form, return it to the researchers and then their child's questionnaire was deleted. 420 adolescents filled in the first questionnaire, three parents requested his or her child to be excluded, resulting in approved responses from 417 adolescents. Adolescents for whom gaming behavior could not be computed because of missing values in the questionnaire ($n=44$) were excluded, resulting in a total sample of 373 adolescents with complete data. The Central Committee on Research Involving Human Subjects (CCMO) in the Netherlands provided an exemption for this study to seek formal approval at the Medical Ethics Committee.

On the day of the first and second survey a researcher explained study goals and procedures in the classroom. The researcher asked adolescents in class whether or not they played video games (active and/or non-active games) at least once a week. Those who answered “yes” (further referred to as ‘gamers’) subsequently received the ‘gaming questionnaire’, containing questions about gaming characteristics and demographics. Those who answered “no” (further referred to as ‘non-gamers’) received a ‘non-gamers questionnaire’, only asking about demographics. Participants completed the paper-and-pencil questionnaires in class during school-time supervised by the researcher or teacher. As part of the larger study the gamers completed a second questionnaire one month later (T2) in the classroom. For the present study, we used the questions about country of birth, access to game consoles, game companion and location from this T2 questionnaire. Among adolescents who completed both questionnaires there was a random incentive draw for two MP3 players, six gift vouchers for video games of €10, and six gift cards for video games of €25.

Demographics (birth date, gender, educational level (pre-vocational; higher continued education; pre-university), country of birth (T2)) were inquired. Educational level was dichotomized in low level (pre-vocational) and high level (higher continued education and pre-university). Adolescent’s ethnicity (Dutch; non-Dutch i.e. at least one parent was born abroad (cf. Statistics Netherlands, 2012) [20]) was assessed. Degree of urbanization was determined using surrounding addresses density of the municipality of adolescent’s school (moderately through extremely urbanized=urban; not urbanized through hardly urbanized=non-urban) (cf. Statistics Netherlands, 1998) [21].

Access to game consoles/applications (e.g. PC, Xbox, PlayStation, Gamecube, Nintendo Wii, Dance Dance Revolution, EyeToy, Mobile phone, iPod, PDA or other) in adolescents’ home was assessed at T2.

Time spent playing active and non-active games was assessed using questions derived from existing and validated questionnaires on energy balance related behaviors for adolescents and modified to reflect the target behavior gaming [22]. For both active and non-active gaming, frequency and duration was asked separately for school and weekend days. Frequency was assessed by asking: “How often do you play active/non-active games during a school week/the weekend?” with answering categories ranging from 1 to 5 days a week for a school week and 1 or 2 days for the weekend. Answering options “never” and “I did not engage in that activity last week but I normally do” were coded at zero. Duration was assessed by asking “How much time do you spend playing active games/non-active games on a school day/weekend day?” with answering categories <30 min, 30–60 min, 1–2 h, and >2 h. For calculating average time spent on gaming per school week or weekend, the number of days per school week or weekend was multiplied by the mid category values of the duration of gaming per day (“<30 min”= 15 min; “30–60 min”= 45 min; “1–2 h”= 90 min; “>2 h”= 150 min). Next school week

and weekend were combined to calculate mean hours per week. Next, time spent active gaming was dichotomized in <1 h per week and ≥ 1 h per week [17]. Because there is no general accepted cut off value for active gaming, this cut-off value was based on calculations in adults demonstrating that weight gain can be prevented if the energy balance is restored by 70kcal a week [23]. We computed, based on energy expenditure studies, that substituting 1 h per week of non-active gaming by playing active games may be sufficient to prevent excessive weight gain [17]. Time spent non-active gaming was dichotomized in ≤ 7 h per week and >7 h per week. We used 1 h per day as the cut off value, because this represents half of the 2 h maximum for total screen time recommended for adolescents [24] and is the same cut off used by Allahverdipour et al. used in their study for non-active gaming [25].

Companions and locations and for active and non-active game play were assessed at T2. For assessing companions it was asked how often (ranging from never (1) to (almost) always (5)), using 5-point Likert scales, they played active and non-active video games alone and with various companions (parents, brothers/sisters, and friends). For determining location it was asked where (living room, own bedroom, brother's/sister's room, the attic, shared computer room, or someplace else) adolescents usually played active and non-active games.

To explore to which game consoles/applications adolescents had access to in their home (aim 1), to evaluate the prevalence and time spent on active and non-active gaming (aim 2) and to explore locations and companions for active and non-active game play (aim 3), descriptive statistics were computed in IBM SPSS Statistics version 20. To examine demographic correlates of playing active and of non-active games (aim 4), two multi-level logistic regression analyses were performed, consisting of three levels to account for clustering of pupils within classes and of classes within schools. The dependent variable in the first analysis was playing active games (more or less than 1 h per week) and for the second analysis it was playing non-active games for more or less than 7h per week. In both analyses, age, gender, ethnicity, following educational level and school area were entered simultaneously as independent variables. These analyses were run in MlwiN version 2.26 and P-values <0.05 were considered statistical significant.

Results

Participants' ($n=373$ adolescents) mean age was 14.0 years ($sd=1.4$), 55% were male, 83% were from Dutch origin, 65% followed high educational level, and 52% attended a school in a non-urban area. Our sample was similar to the general Dutch adolescent population in terms of gender, ethnicity and level of education [26].

Forty-seven percent of gaming adolescents had home access to Wii, 11% to EyeToy, 4% to Dance Dance Revolution. Regarding non-active game consoles and platforms, 95% had access to a PC at home, 52% to a PlayStation and 23% to an Xbox. Of all participants ($n=373$), 3% reported to play exclusively active games, 40% active games and non-active games, 40% exclusively non-active games, and 17% reported not playing video games at all.

Active gaming adolescents played on average on 1.5 ($sd=1.2$) days per school week for 36 min ($sd=32.9$) and 1 ($sd=0.54$) day per weekend for 42 ($sd=36.5$) min. Of the active gaming adolescents, 28% played active games for ≥ 1 h per week. Of all 373 participants, 80% reported to play non-active games (exclusively or in addition to active games) at least once a week and played on average on 3.3 ($sd=1.6$) days per school week for 65 ($sd=46.0$) min and 1.4 ($sd=0.65$) days per weekend for 80 ($sd=50.8$) min. Almost 30% of the adolescents playing non-active games, played for >7 h per week.

Active game players usually played in the living room (71%), 7% in a shared game room, 4% in their brother's/sister's bedroom, 4% reported their own bedroom, and 3% the attic. Non-active game players usually played in the living room (40%) or in their own bedroom (40%), 6% in a shared game room, 4% reported the attic, and 3% their brother's/sister's bedroom. Of the active game players, 29%, 32%, 32% and 10% reported to play regularly or often (score 4 or 5 on 5-point Likert scales) alone, with brothers/sisters, with friends or with parents, respectively. Of the non-active game players, 72%, 25%, 44% and 3% reported to play regularly or often (score 4 or 5 on 5-point Likert scales) alone, with brothers/sisters, with friends or with parents, respectively.

Table 1 shows the prevalence of playing active games ≥ 1 h per week and non-active gaming >7 h per week separated for demographic factors and the association with potential demographic correlates. Logistic regression analyses showed that age, gender, ethnicity and school area were not, but educational level was significantly associated with active gaming ≥ 1 h per week. Adolescents attending lower levels of secondary school were more likely to play active games ≥ 1 h per week than adolescents attending higher levels of secondary school. Logistic regression analysis showed that age and gender were, but ethnicity, educational level and school area were not significantly associated with playing non-active games >7 h per week. Boys and older adolescents were more likely to play non-active games >7 h per week, than girls or younger adolescents.

Table 1: Odds ratio's or β and 95% confidence intervals (95%CI) for potential demographic correlates of ≥ 1 hour per week active gaming and >7 hours per week non-active gaming

	% active gaming ≥ 1 hour per week ^c	OR/ β	95%CI	% non-active gaming >7 hours per week ^c	OR/ β	95%CI
		β			β	
Age (range 11-17 years) ^a		0.89	0.73 - 1.09		1.28	1.02-1.61*
		OR			OR	
Gender Boys (n=205) Girls (ref) (n=168)	29% 26%	1.21	0.70 - 2.09	48% 5%	10.94	5.34-22.41**
Ethnicity ^b Non-Dutch (n=59) Dutch (ref) (n=283)	25% 27%	0.84	0.42 - 1.68	25% 29%	1.35	0.60-3.03
Educational level following High (n=243) Low (ref) (n=130)	24% 35%	0.44	0.22 - 0.87 *	25% 36%	0.76	0.35-1.65
School area Urban (n=178) Non-Urban (ref) (n=195)	29% 26%	1.58	0.77 - 3.27	26% 32%	0.91	0.42-1.98

^a9 missing values on age, tested as a continuous variable

^b31 missing values on ethnicity

^cPercentages are row percentage

*P<0.05

**P< 0.001

Discussion

The present study indicates that many adolescents play video games, both active and non-active video games. Time spent on active games (36 min on a school day and 42 min on a weekend day) was about half the time spent on non-active games (65 min on a school day and 80 min on a weekend day). The findings with respect to non-active gaming are comparable to other studies [9;15]. What the present study adds is insight into prevalence and time spent in active gaming. As expected, the prevalence of and time spent on active gaming was lower than of non-active gaming. Yet, already almost half of Dutch adolescent gamers played these relatively new types of video games. Potentially, a large group of gaming adolescents may be reached with active games.

In the present population-based sample, active video gaming was more prevalent (43%) than in previous studies. A Canadian study, among 14–19 year-olds showed that only 25% of their sample played active video games and played 2 days per week on average, for 50 min each bout [16]. Another Dutch study among 12–16 year-olds, showed an average of 80 min a week playing active games [17].

The cut off value of ≥ 1 h per week active gaming, determined for the current study, was only met by a quarter of the active gamers and time spent in active gaming was much lower compared to non-active gaming. For active gaming to be an effective strategy for reducing sedentary behavior, additional efforts are required to increase the duration of active game play at the expense of non-active gaming. It is important to emphasize that active games should not replace sports or traditional physical activities. Baranowski et al. showed that only providing an active game without any instruction for use is probably not enough to significantly reduce sedentary behavior in youth [27], suggesting the need for extra effort to stimulate (ongoing) use of active games. Focus groups with adolescents revealed several motivational elements such as introducing more variation, and more precise translation of body movements into game play [11].

The social aspect of active gaming warrants further discussion. Based on game companions and location, active gaming seems to reflect a social and family activity more than non-active gaming does. Active game programs should take this into account and should focus on playing active games with family and friends in order to optimize sufficient and sustained use [18;19].

When looking at demographic correlates of active gaming it showed that adolescents following a lower educational level were more likely to play active games ≥ 1 h per week than adolescents following a higher educational level. This is an important finding because lower educated adolescents are generally engaging in more unhealthy behaviors [28;19]. Lower educated people are generally difficult to reach with traditional interventions that aim to educate individuals about benefits of activity and aim to persuade

them to become more active. Entertainment-oriented approaches (such as active games) might be more successful in this targetgroup [30]. Active games can promote behavior change without relying on education or persuasion. Remarkably, sex appeared not to be a correlate of active gaming, which is in contrast with the finding of O'Loughlin et al. who found that girls were more likely to play active games [16]. As such, active gaming appears a feasible tool also for girls who form a relevant group because of a suggested larger decline in PA than boys during adolescence [3]. With respect to demographic correlates of non-active gaming we found, consistent with other studies, that boys and older adolescents were more likely to play non-active games >7 h/week [8;10;14]. In sum, results indicate that active gaming is a common activity in both boys and girls, young and older adolescents, urban and non-urban school areas and especially for adolescents following a lower educational level.

A strong element of the current study is that it is the first focusing on active and non-active gaming simultaneously. A limitation that should be acknowledged is the use of self-reported data. Further, insight is also needed in social, personal and environmental correlates of active and non-active gaming and potential effect on body weight.

Conclusion

In conclusion, it seems that many adolescents and especially following a lower educational level, who are difficult to reach with educational interventions, can be reached with active games as they do not rely on education. Although, to be a feasible public health strategy, interventions employing active games should achieve more time spent on active gaming at the expense of non-active gaming.

Practical implications

- Many adolescents engage in active gaming, especially adolescents following a lower educational level, so an active gaming intervention could have a wide reach.
- For active gaming to have potential health benefits, additional efforts are required to increase the duration of active game play, at the expense of non-active video game play.
- Active game programs should focus on playing active games with family and friends for optimizing sufficient and sustained use of active games.

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