Brief report

Video game playing time and cardiometabolic risk in adolescents: The AFINOS study

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A R T I C L E   I N F O

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A B S T R A C T

Background and objective: We aimed to examine the association of video games playing time with cardiometabolic risk biomarkers in adolescents.

Subjects and methods: This study comprised 181 adolescents (88 girls), aged 13 to 17 years old. Moderate-to-vigorous physical activity (MVPA) was measured by accelerometry, and video game playing time in computer and console was self-reported. Waist circumference, systolic blood pressure (BP) and diastolic BP, mean arterial pressure, HDL-cholesterol, LDL-cholesterol, total cholesterol, triglycerides, glucose, insulin, and apolipoproteins A-1 and B-100 were measured.

Results: Computer games use was not significantly associated with any biomarker (P > 0.1) but the time spent using console games was positively associated with diastolic BP, mean arterial pressure, triglycerides, and a clustered cardiometabolic risk score. These results were independent of age, sex, pubertal stage, MVPA, and WC.

Conclusion: These results support some evidence regarding a plausible unfavorable role of playing (console) video games on cardiometabolic health in adolescence.

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Jugar con videojuegos y riesgo cardiometabólico en adolescentes: Estudio AFINOS

R E S U M E N

Fundamento y Objetivo: El objetivo del estudio ha sido examinar la asociación entre el tiempo empleado jugando con videojuegos y biomarcadores de riesgo cardiometabólico en adolescentes.

Sujetos y Método: El estudio incluyó 181 adolescentes (88 chicas), con edades comprendidas entre los 13 y los 17 años. La actividad física a intensidad moderada y vigorosa se valoró mediante acelerometría, y el tiempo jugando con videojuegos en el ordenador y la consola fue auto-reportado. Los niveles de circunferencia de cintura, presión arterial (PA) sistólica, PA diastólica, PA media, LDL-colesterol, colesterol total, triglicéridos, glucosa, insulina, apolipoproteínas A-1 y B-100 se midieron.

Resultados: El tiempo jugando con juegos de ordenador no se asoció con ninguno de los marcadores estudiados, pero el tiempo empleado en juegos de consola se asoció positivamente con la PA diastólica, la PA media, triglicéridos y un indicador agrupado de riesgo cardiometabólico. Estos resultados fueron independientes de: edad, sexo, estadio puberal, actividad física de intensidad moderada y vigorosa, y circunferencia de cintura.

Conclusion: Estos resultados muestran alguna evidencia de la influencia negativa que tiene jugar con videojuegos (en consola) sobre la salud cardiometabólica en la adolescencia.

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Introduction

The population health science of sedentary behavior highlights the detrimental effect of prolonged periods of sitting time on metabolic health. Total sedentary (primarily sitting) time and the time spent in specific sedentary activities such as television watching and driving automobiles are related to all-cause and cardiovascular mortality as well as an unfavorable cardiometabolic profile in adults. In youth, there is some evidence regarding the influence of sedentary time and television watching time in cardiometabolic risk factors. The influence of other sedentary behavior as video games playing on cardiometabolic health in youth is scarce and limited to experimental studies in laboratory settings – short-term effects. Whether an excess of playing video games may contribute to cardiometabolic abnormalities in children and adolescents is unknown.

The aim of this study was to examine the association of video games playing time in computer and console devices with cardiometabolic risk biomarkers in adolescents.

Methods

Participants

The sample employed in this study comprised 181 adolescents (88 girls), aged 13- to 17 years old, who were part of the AFINOS (La Actividad Física como Agente Preventivo del Desarrollo de Sobrepeso, Obesidad, Alergias, Infecciones y Factores de Riesgo Cardiovascular en Adolescentes/Physical Activity as a Preventive Measure Against Overweight, Obesity, Allergies and Cardiovascular Disease Risk Factors in Adolescents) cross-sectional study. In brief, the AFINOS study was designed to assess health status and lifestyles through a survey completed by a representative sample of adolescents (n = 2000), aged 13–17 years, from the Madrid region. In addition, a set of measurements including anthropometry, objectively measured physical activity (PA), physical fitness, and blood analysis were performed in a sub-sample of adolescents. Descriptive data for physical characteristics, fatness, PA by accelerometry, and cardiometabolic risk biomarkers of the sub-sample herein included were presented elsewhere. The whole data collection period in this sub-sample lasted 4 consecutive months between 2007 and 2008.

Study variables

Video game playing time was obtained by self-report. A brief questionnaire was administered within the school hours and adolescents reported the usual number of hours in computer and console games separately for a typical weekday and weekend day. The average time spent in computer games (min/d) was calculated using the following formula: (total weekday computer games + weekend computer games) / 7. The average time spent in console games (min/d) was calculated using a similar formula. After overnight fasting for 10-h, blood samples were collected between 8 and 9 a.m. Blood was extracted by venipuncture from the antecubital vein (16 ml) in all participants.

Some cardiometabolic risk biomarkers were selected for the present study: waist circumference (WC), systolic and diastolic blood pressures, mean arterial pressure (MAP), HDL-cholesterol, LDL-cholesterol, total cholesterol, triglycerides, glucose, insulin, and apolipoproteins A-1 and B-100.

Additionally, a clustered cardiometabolic risk score (Z-score) was computed using those cardiometabolic risks (MAP, HDL-cholesterol, triglycerides, and glucose) suggested by the International Diabetes Federation for the definition of the metabolic syndrome in youth. This score was previously standardized for age, sex, pubertal stage, and accelerometer-measured moderate-to-vigorous PA (MVPA) variables using a lineal regression process.

Statistical analysis

Descriptive characteristics are presented as mean ± SD. All the variables were checked for normality of distribution before the analysis and transformations were performed when necessary. Natural logarithm was applied to WC, HDL-cholesterol, LDL-cholesterol, total cholesterol, glucose, and insulin. Interaction factors for sex (sex × main exposures) were checked to determine whether sex modified the associations of PA, CRF and fatness with inflammatory markers. Since no significant interaction was found for sex, all analyses were performed with boys and girls together.

Multiple linear regression analysis, adjusted for potential confounders when necessary (age, sex, pubertal stage, MVPA, and WC), examined the associations of computer and console video games with individual and clustered cardiometabolic risk variables. Analyses were conducted using SPSS version 18 for Macintosh.

Results

Mean ± SD of time spent playing video games in computer and console in the total sample was 43.2 ± 53.6 min/d and 8.6 ± 0.8 min/d, respectively. Interaction factors sex × main exposures in the model were tested, but there were no evidence (P > 0.1) that sex could modify the association between playing video games and cardiometabolic risk biomarkers. Consequently, all analyses were performed with adolescent boys and girls together.

Table 1 shows the associations between playing video games and individual cardiometabolic risk biomarkers. Computer games use was not significantly associated with any biomarker (P > 0.1) after controlling for sex, age, pubertal status, MVPA, and WC. However, the time spent using console games was positively associated with some conventional biomarkers (i.e. diastolic blood pressure, MAP and triglycerides) after controlling for potential confounders (Table 1).

Playing computer games was not associated with the clustered cardiometabolic risk score (β = 0.08, P = 0.289 [adjusted R² = −0.01]), whereas high levels of console games use was significantly associated with unfavorable levels in this clustered risk factor (β = 0.21, P = 0.006 [adjusted R² = 0.03]). When WC was taken out of the clustered cardiometabolic risk biomarker and included as a confounder variable in the model, the results did not substantially change (β = 0.11, P = 0.112 [adjusted R² = 0.12] for computer games and β = 0.20, P = 0.007 [adjusted R² = 0.14] for console games).

Discussion

In the present study in apparently healthy adolescents the main findings suggest that video games playing time, specifically in console games, is positively associated with individual and clustered cardiometabolic risk biomarkers, independently of potential confounders including MVPA. Despite we only found modest associations, this cross-sectional evidence supports a plausible unfavorable role of playing video games on cardiovascular and metabolic diseases in adolescence. These findings have public health relevance since secular trends in video game use and device availability at homes seems to have increased the last years. To the best of our knowledge, this is the first study examining the association between video games playing time and cardiometabolic biomarkers in free-living conditions. Previous results in
cross-sectional studies cannot be compared because, in general, they pooled several sedentary activities (e.g. television watching plus computer use) in the same variable for the analyses. This fact prevented to know the independent role of each sedentary behavior on health. On the other hand, several experimental studies in laboratories found that video games have a negative short-term impact on cardiometabolic factors such as heart rate variability and blood pressure in children and adolescents after playing.

Interestingly, our results show that only console games are related to cardiometabolic biomarkers, even adolescents spent less time in console games than in computer games in our sample. Although possible explanations for the device-specific association observed cannot be tested in the current study, the different type of games played in computer and console devices might be important.

Nowadays video games are not considered totally dangerous for health. For example, some specific video games have been developed for health promotion in schools and home settings. Likewise, a few studies emphasize the positive consequences of playing video games on brain and mental health in youth. In addition, health-related research is evaluating the potential of active video games (also called exergaming) to improve PA levels in young people.

This study has some limitations. For example, these findings may not be generalizable due to the relatively small sample size, and the cross-sectional design cannot establish the causal direction between the variables under study. Also, video game playing time was self-reported. Consequently, further cross-sectional and longitudinal studies in both youth and adults are need to provide more information regarding the long-term impact of video game playing time on cardiometabolic health.

### Conflict of interest

The authors declare no conflicts of interest.

### Acknowledgments

The authors would like to thank the adolescents and their parents who participated in this study. This study was financially supported by the Spanish Ministry of Education and Science (DEP2006-56184-C03-02/PREV and AP2006-02464) and by the European Union funds (FEDER). DMG had full access to all the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis. The content of this article reflects only the authors’ views, and the European Union is not liable for any use that may be made of the information contained therein.

### References


### Table 1

Associations between playing video games and cardiometabolic biomarkers in adolescents (n = 181).

<table>
<thead>
<tr>
<th></th>
<th>Computer games (min/d)</th>
<th>Console games (min/d)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>β</td>
<td>P</td>
</tr>
<tr>
<td>Waist circumference (cm)</td>
<td>–0.04</td>
<td>0.01</td>
</tr>
<tr>
<td>Systolic blood pressure (mmHg)</td>
<td>0.05</td>
<td>0.451</td>
</tr>
<tr>
<td>Diastolic blood pressure (mmHg)</td>
<td>0.13</td>
<td>0.102</td>
</tr>
<tr>
<td>Mean arterial pressure (mmHg)</td>
<td>0.12</td>
<td>0.123</td>
</tr>
<tr>
<td>HDL-cholesterol (mg/dl)</td>
<td>–0.07</td>
<td>0.369</td>
</tr>
<tr>
<td>LDL-cholesterol (mg/dl)</td>
<td>0.01</td>
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</tr>
<tr>
<td>Total cholesterol (mg/dl)</td>
<td>0.01</td>
<td>0.920</td>
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<tr>
<td>Triglycerides (mg/dl)</td>
<td>0.11</td>
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<tr>
<td>Glucose (mg/dl)</td>
<td>–0.03</td>
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<td>Insulin (mU/ml)</td>
<td>–0.08</td>
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</tr>
<tr>
<td>Apolipoprotein A-1 (mg/dl)</td>
<td>–0.02</td>
<td>0.843</td>
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<tr>
<td>Apolipoprotein B-100 (mg/dl)</td>
<td>–0.02</td>
<td>0.804</td>
</tr>
</tbody>
</table>

Model 1: adjusted for age, sex, pubertal stage and moderate-to-vigorous physical activity. Model 2: adjusted for Model 1 + waist circumference.

* Ln-transformed.

Statistically significant values are showed in bold.