

Obesity and sedentarism in children and adolescents: What should be done?

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Abstract

Paediatric overweight continues to be a public health problem, and the etiology of obesity is multifactorial and complex. Dietary patterns, physical activity (PA) and sedentary behaviors are acknowledged as major behavioural determinants of obesity. New technologies and electronic based activities have produced a decrease in PA levels, and an increase in sedentary activities in children and adolescents. Potential mechanisms that explain the association between TV viewing and childhood obesity are: displacement of PA, unhealthy food preferences produced by food advertisements, a higher energy intake by automatic eating and overconsumption caused by distraction. Interventions aimed to reduce time in sedentary behaviours are in children generally positive. However, their benefits on adiposity markers are small. Thus, if global and macro-level *obesogenic* factors are not changed substantially, the interventions oriented to prevent obesity will produce small benefits.

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Key words: *Obesity. Sedentary behaviour. Children. Adolescent.*

OBESIDAD Y SEDENTARISMO EN NIÑOS Y ADOLESCENTES: ¿QUÉ DEBERÍA HACERSE?

Resumen

El sobrepeso en población en edad pediátrica continúa siendo uno de los problemas de salud pública. La alimentación, actividad física y las conductas sedentarias son los mayores determinantes de la obesidad. Las nuevas tecnologías y las actividades basadas en la electrónica han producido un descenso en los niveles de actividad física y un aumento de las actividades sedentarias en niños y adolescentes. Diversos mecanismos se han sugerido para explicar la asociación entre ver la televisión y la obesidad: desplazamiento de actividad física, los efectos de la publicidad de alimentos, el aumento de la ingesta energética en ausencia de hambre (automáticamente), y el aumento de la ingesta producida por la distracción. Intervenciones orientadas a reducir el comportamiento sedentario en niños y adolescentes han mostrado ser exitosas. Sin embargo, su impacto sobre marcadores de adiposidad es pequeño. Por lo tanto, si los factores obesogénicos que dependen de escalas a nivel global y macro no son cambiados substancialmente, los beneficios de las intervenciones para prevenir la obesidad serán muy modestos.

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Palabras clave: *Obesidad. Conductas sedentarias. Niños. Adolescentes.*

Abbreviations

HELENA: Healthy Lifestyle in Europe by Nutrition in Adolescence.

PA: Physical Activity.

TV: Television.

Introduction

Paediatric overweight continues to be a major and growing public health problem, although stability or a

levelling off in the prevalence of obesity has been observed among children and adolescents in several parts of the world.¹ A multi-factorial approach to obesity prevention requires changes in multiple factors contributing to energy imbalance. Dietary patterns, physical activity (PA) and sedentary behaviours are acknowledged as major behavioural determinants of obesity.²⁻⁴

In the last decades developed countries have suffered a deep change in the traditional way of life. Labour saving technologies and electronic based recreational activities have produced a marked decrease in children PA levels. In addition, sedentary activities are increasing, and involve all activities involving low levels of moderate-vigorous physical activity, including television (TV) and computer use, school work, reading, playing or listening music. The most prevalent form of sedentary behaviour is time spent in front of a screen, which includes television, videos, computer and video games. The American Academy of Pediatrics recommends that children limit their total media time to no

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more than 1-2 h a day;⁵ while more restrictive limits are applied to pre-school children for instance in Australia, recommending less than 1 hour per day of sitting and watching TV and the use of other electronic media.⁶ There is a huge variation on the prevalence on excessive sedentary time between countries. Children and adolescents spent on average 1.8 to 2.8 hours of TV per day, depending on age and gender.⁷ For instance, in several European countries 61% of children aged between 11 to 15 years watched TV more than 2 hours/day. In adolescents from the Healthy Lifestyle in Europe by Nutrition in Adolescence (HELENA) study, the proportion of adolescents watching TV during weekend days, more than 2 hours/day was 58% in males and 53% in females.⁸

The aim of this study is to review the current literature regarding sedentary behaviours and their relation with obesity in children and adolescents.

Sedentary behaviours and obesity

Most of scientific community agree that the growth in worldwide prevalence of obesity during the last decades is due to profound changes in our (traditional) lifestyle. That is, today people are more sedentary (in transportation, jobs and leisure time). Furthermore, many countries are losing their traditional (healthy) diets by others rich in animal products, refined grains and sugar.

Several studies have showed the relationship between an increase of several sedentary behaviours, for instance television viewing or screen time, and weight gain.^{4,9} In addition, a novel risk factor for weight gain in adolescents is TV availability in the bedroom. Those adolescent males who reported having a TV in the bedroom had higher risk of having higher body mass index, high waist circumference and body fat,¹⁰ and to have a TV in the adolescent's bedroom increased the risk of having central obesity.¹¹ Moreover screen-viewing behaviour (TV viewing, playing computer games and using the internet) has been associated with higher consumption of energy dense foods (i.e. sweetened-beverages and savoury snacks) and lower consumption of healthy foods (i.e. fruits).¹² In the same line, an inverse association between several indicators of sedentary

behaviours and healthy dietary patterns, and a positive association with snacking patterns has been observed in other young-age population groups.¹³ On the other hand, we¹⁴ and others¹⁵ have observed that adolescents who spent long time playing with videogames were more likely of having cardiovascular risk factors. Interventions aimed at reducing screen time have been a focus of childhood obesity prevention and treatment, however the evaluation of their effectiveness need to be taking into account in order to develop successful prevention programs.

Currently, most children and adolescents spend the majority of their leisure time in sedentary behaviours. This is of concern for children's health because In 1985, Dietz and Gortmaker found a positive association between hours of TV viewing and obesity in children and adolescents.¹⁶ Since then, multitudes of studies in different countries have found similar associations. In fact, we reviewed studies (cross-sectional, longitudinal and intervention) focused in the relationship between obesity markers and sedentary behaviours.⁴ We concluded that there was enough evidence for the *obesogenic* effect of TV viewing, especially in children. More recent reviews support our findings. In children, a moderate evidence was observed between TV viewing and obesity.¹⁷ In contrast, in adolescents insufficient evidence was found for a longitudinal positive relationship between TV viewing and body mass index or more specific indicators of fat mass.¹⁸ For videogames and computer use more studies are needed, but not positive associations were found.⁴ Several mechanisms can explain the *obesogenic* effect of TV viewing. Here, we briefly discuss the four main mechanisms.

Mechanisms linking TV viewing with obesity

Obesity has a multifactorial origin. TV viewing may promote a positive energy balance by different ways (fig. 1):

TV viewing and physical activity

One explanation is that TV viewing displaces time spent in physical activity. Some study supports this

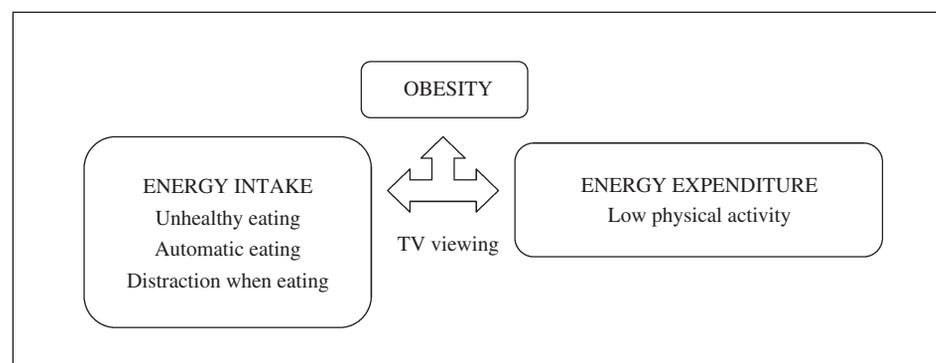


Fig. 1.—Potential mechanisms by which TV viewing may lead to obesity.

mechanism. Children spending more time watching television (>120 minutes/day) at age six were less active and had higher body mass indices at ages eight and ten.¹⁹ However, in a cross-sectional study conducted in children and adolescents, TV viewing and physical activity were not associated.²⁰ Interestingly, in the latter study eating meals while watching TV was positively associated with obesity. Recently, we found that even adjusting for vigorous physical activity, a TV set in the bedroom was associated with abdominal obesity in European adolescents.¹¹ These findings indicate that TV viewing may favour a positive energy balance for mechanisms beyond the physical activity level.

TV viewing and unhealthy food advertisements

Currently, food industry makes use of different channels (internet, toys, games, sponsoring, and school material) to advertise their food and drinks to children and their parents. However, in children TV advertisements are the most effective and most heavily used marketing instrument.²¹ Unfortunately, food companies have traditionally used TV ads to promote the consumption of caloric dense and highly palatable products.²² In theory, the more food advertisements children see, the more primed they are to want to eat or drink the advertised food. Remarkably, it has been estimated in some studies that children are exposed to 25,000 TV ads per year. About 20% of them, are related with food/drink products.

Automatic eating while watching TV

This mechanism is based on the assumption that part of the human behaviours are automatic, cued by environmental stimuli, resulting in actions unaccompanied by conscious reflection. For instance, in laboratory studies children exposed to food ads ate automatically even in the absence of hunger.²³ Remarkably, the type of food advertised was not available for the concurrent consumption. Therefore, the overconsumption attributed to TV viewing can be explained by unconscious actions. Today food companies are replacing TV advertising with more subtle marketing strategies. Advertisers methodically place food products into programs, movies, musical videos. Product placements can be shown by direct visual or auditory signals but also indirectly (product is part of the background, but attention is not paid to the product). In summary, food placements can lead to obesity by increasing (automatically) the energy intake and favouring the less direct advertised food product.

Distraction while watching TV

In some countries is common to eat while watching TV. This distraction can lead to “mindless eating,” or a

lack of attention paid to the amount of consumed food. In laboratory studies, children consumed significantly more food when watching a continuous TV program than when they watched a repeated segment of a TV program.²⁴ Similarly, individuals who viewed TV while consuming a meal were less accurate in estimating the amount of food they had consumed than those who consumed the meal without TV.²⁵

Food habits and sedentary behaviours

Several studies have been reported that those children who spent more time watching TV were more likely to consume sweets and drinks, and less likely to consume fruits and vegetables daily.²⁶ In addition, adolescents were more likely to consume energy-dense foods and drink products while watching TV.²⁷ Also, the amount of sugar sweetened beverages and snacks increased significantly when the adolescents spent more time in several sedentary behaviours like TV viewing, playing computer games and using the internet.¹² In the same population group, the amount of fruits consumed decreased when they spent more hours in these activities (figs. 2 y 3).

Interventions aiming to decrease sedentary behaviours

A huge variation of interventions has been published linking several sedentary behaviours and obesity. Several systematic reviews and meta-analysis have been recently published regarding the effectiveness of interventions aiming to decrease sedentary behaviours.^{28,29} In a review, 13 trials with children aged between 3.9 to 11.7 years;²⁹ whereas another included both children and adolescents resulting in 34 intervention studies.²⁸ Effective interventions on reducing TV viewing have been described in pre-schoolers and young children, showing significant decreases on time spent in this sedentary behaviour when comparing the intervention group versus the control one (24.4% reduction versus 11.8% increase; and 42.7% reduction versus 6.5% reduction, respectively).^{30,31} In the same line, the results in the whole group are consistent with these results, reported that intervention on sedentary behaviours decreased significantly the time that children spent on it.²⁸ The intervention group compared with the control group showed a difference in mean change in screen time of -3.72 hours/week (95% CI -7.23 to -0.20 h/week) in children younger than 6 years; however no statistical significances were found in children and adolescents older than 6 years (-0.19 IC 95% -3.12 to 2.75).

Wahi et al did not showed enough evidence about the effectiveness of interventions aimed to reduce screen time in children to reduce body mass index (-0.10 (95% CI -0.28 to 0.09)).²⁹ Nevertheless, in the preschool age group significant reductions in the effect associations of screen time reductions and reducing BMI were obser-

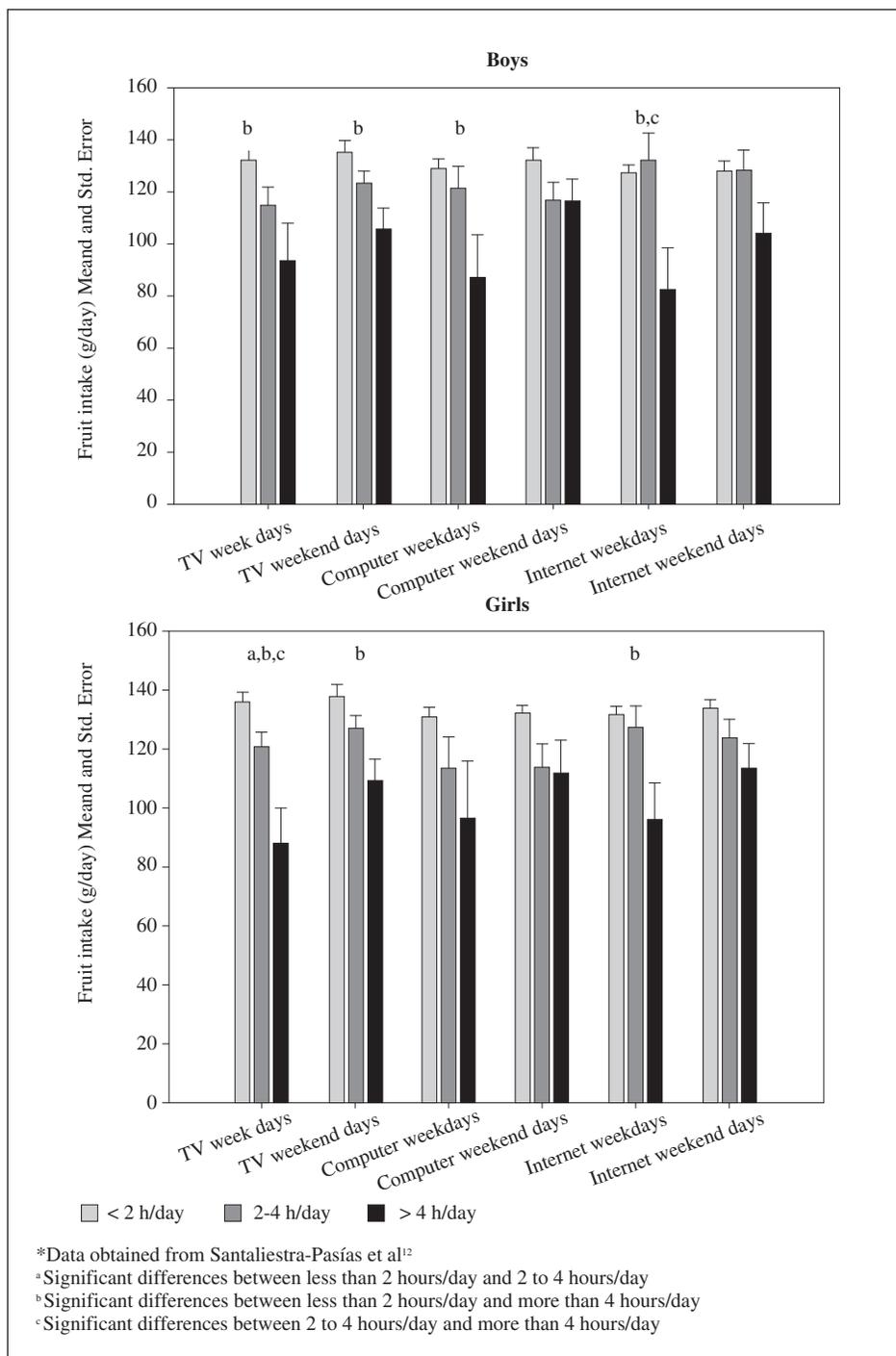


Fig. 2.—Fruit intake according to sedentary behaviours in European adolescents by sex*.

ved.²⁹ In addition, when the meta-analysis of interventions includes only young children, the results indicate that interventions performed in school- and general population settings can help prevent excessive sedentary behaviour and unfavourable health outcomes.²⁸ Van Grieken et al. showed that for sedentary behaviours the post-intervention mean difference was -17.95 minutes/day (95% CI -26.61 to -9.28) and for BMI, the post-intervention group mean difference was -0.25kg/m² (95% CI -0.40 to -0.09).

Conclusion

The etiology of obesity is multifactorial and complex. The evidence of different *obesogenic* factors is stronger in some ages than others (Example: TV viewing is strongly associated with obesity in childhood but less consistently during adolescence). Currently, the prevalence of sedentary behaviours related with screen time is high,^{12,32} therefore interventions to decrease time spent in sedentary behaviours may help to reduce

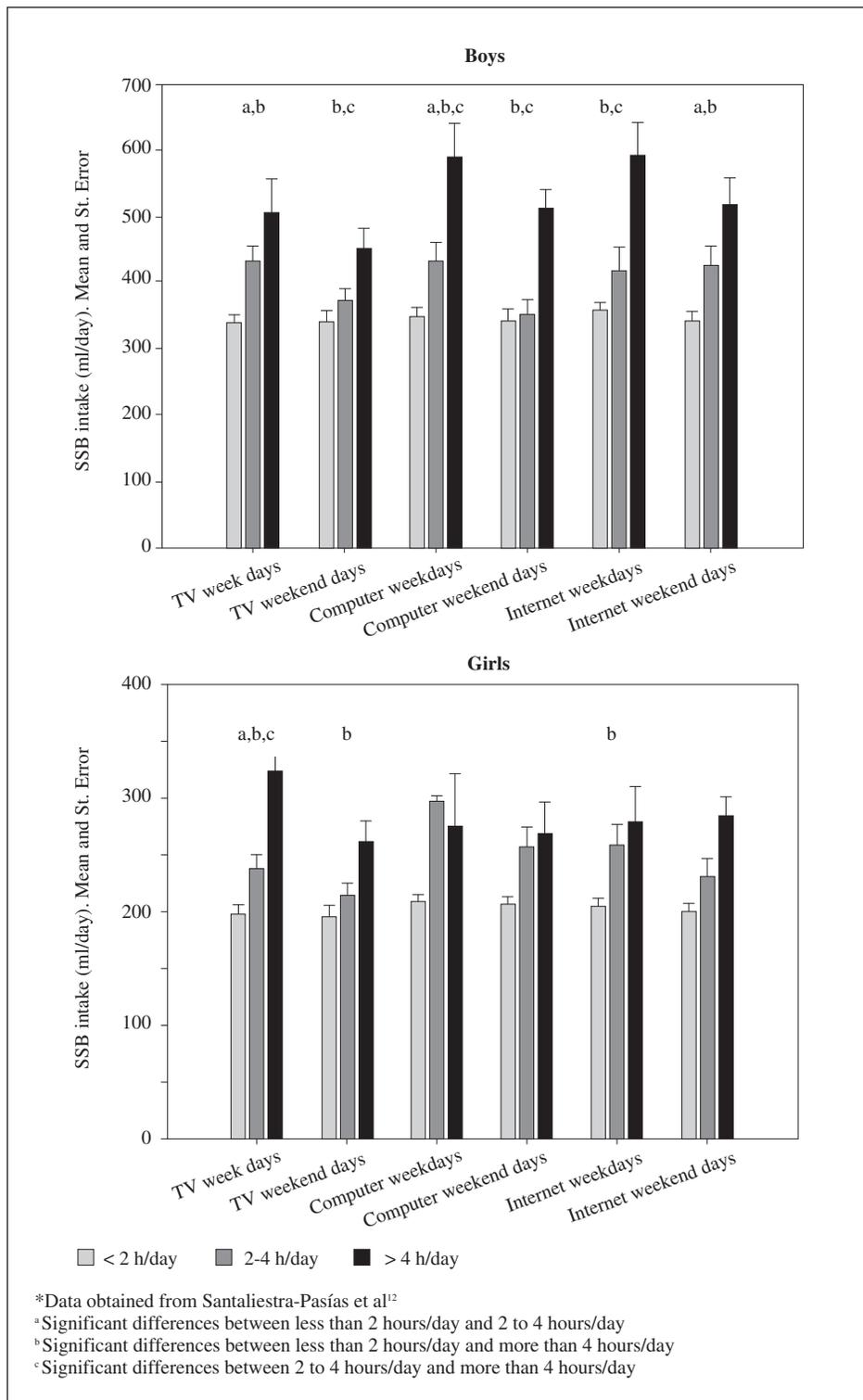


Fig. 3.—Sugar sweetened beverages intake according to sedentary behaviors in European adolescents by sex*

the prevalence of obesity. The current evidence says that decreasing and breaking sedentary behaviours may be important for achieving a better population health. In order to obtain a benefit in terms of body composition indicators, it is highly recommended to focus on pre-school population. Some practical recommendations can

be made based on several observational and laboratory studies but the value of these recommendations should be tested by intervention studies. First, parents should be aware of how different lifestyles impact their children's health in order to promote healthy behaviours. Regarding the familiar environment, it seems recommendable to lay

TV sets outside children/adolescent's bedroom. Second, preferentially children should not eat while watching TV. Third, families should minimize the amount of time that children are exposed to food advertisements. Fourth, governments (i.e. by taxes) and communities (promoting competing sport-games activities) should not incentive passive electronic entertainment. Finally, given the multifactorial origin of obesity, (micro-level) prevention strategies can result unsuccessful if global and macro-levels *obesogenic* factors are not altered substantially.

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