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Factors associated with active commuting to school in adolescents

Factores asociados a los desplazamientos activos al centro escolar en adolescentes

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Abstract

Active commuting contribute to the realization of physical activity by adolescents, being able to exert beneficial effects on health. The aim of the study was to analyze active trips to the school, evaluating their relationship with various lifestyle habits and indicators of physical and psychosocial health, as well as the influence of different sociodemographic variables. The study was conducted on a sample of 761 students (14.51 ± 1.63 years) from 25 educational centers in northern Spain. active commuting to school, hours of nightly sleep, adherence to the Mediterranean diet, physical activity engagement, maximum oxygen uptake, body mass index, health-related quality of life, self-esteem and various sociodemographic factors were analysed for all participants. Being older, studying in urban or publicly owned centers, residing in favorable environments for physical activity, having a low / medium socioeconomic level and having higher levels of physical activity, were found to be predictive factors of active trips to the school. Likewise, active transport reported positive associations with MD. Interventions aimed at promoting active displacement should take these predictive factors into account, trying to apply them especially to the most vulnerable groups.

Keywords: active commuting, adolescence, health, physical activity, wellness.

Resumen

Los desplazamientos activos contribuyen a la realización de actividad física por parte de los adolescentes, pudiendo ejercer efectos beneficiosos para la salud. El objetivo del estudio fue analizar la realización de desplazamientos activos al centro escolar, evaluando su relación con diversos hábitos de vida e indicadores de salud física y psicosocial, así como la influencia de diferentes variables sociodemográficas. El estudio se llevó a cabo sobre una muestra de 761 estudiantes (14,51±1,63 años) de 25 centros educativos del norte de España. Se valoró la realización del desplazamiento activo al centro escolar, horas de sueño nocturno, adherencia a la dieta mediterránea, nivel de actividad física, consumo máximo de oxígeno, índice de masa corporal, calidad de vida relacionada con la salud, autoestima y diversos factores sociodemográficos. Tener mayor edad, estudiar en centros urbanos o de titularidad pública, residir en entornos favorables para realizar actividad física, poseer un nivel socioeconómico bajo/medio y tener niveles de actividad física más altos, resultaron ser factores predictores de los desplazamientos activos al centro escolar. Asimismo, el trasporte activo reportó asociaciones positivas con la dieta mediterránea. Las intervenciones dirigidas a la promoción de los desplazamientos activos deberían tener en cuenta estos factores predictores, tratando de aplicarlas especialmente en los grupos más vulnerables.

Palabras clave: desplazamientos activos, adolescencia, salud, actividad física, bienestar.

Introduction

Physical inactivity is considered to be one of the risk factors with the highest incidence on mortality and, in this regard, the World Health Organization (WHO) recommends that children and young people engage in physical activity (PA) for at least 60 minutes of moderate-vigorous intensity per day (WHO, 2020). The literature has shown that continuous PA has effects on current and future health, confirming as one of the factors, susceptible to modification, with the greatest impact on the health status of the population (Hardman et al., 2009). However, more than 80% of adolescents worldwide don't comply with these recommendations (Guthold et al., 2020). In this sense, encouraging the substitution of passive displacements/transportations (car, public transport, etc.) for active displacements seems to be a recommended strategy not only to increase PA levels, but also turns out to be a key aspect that can have a positive impact on health and the environment (Loh et al., 2021; Gong et al., 2020).

Active displacements and, in this sense, those related to commuting to school, are defined as those that are carried out with methods that assume a metabolic expenditure such as walking, cycling or skating (Nieuwenhuijsen et al., 2020). This behavior contributes to increasing PA levels among schoolchildren (De Jesus et al., 2021), consequently linking to an active lifestyle and different dimensions of health (Xu et al., 2013). Therefore, it is considered as a key influencing means for compliance with the recommendations of 60 minutes per day of PA (Kek et al., 2019), while increasing the likelihood of presenting a positive attitude towards active displacements at later stages. (Frömel et al., 2020). In this sense, scientific literature links an active lifestyle with higher probabilities of following other healthy lifestyle habits, reflected especially in more balanced eating behaviors (Chacón-Cuberos et al., 2018) and better sleep patterns (Loureiro et al., 2021).

Regarding its impact on health, previous studies in adolescents have shown that investing at least 15 minutes per day in this type of displacement is linked to greater happiness and general well-being (Ruiz-Ariza et al., 2015), also reducing the likelihood of suffering mental disorders (Gu et al., 2020). Similarly, dedicating one hour per week to this type of transportation seems to have a positive effect on the waist circumference, the body mass index (BMI), cholesterol and aerobic fitness, reinforcing its direct influence on physical health (Larouche et al., 2014; Larouche, 2018). However, despite the aforementioned benefits, trends among schoolchildren have evidenced a decline in the last decade as reflected in international European studies (Reimers et al., 2021; Pavelka et al., 2017), although at the national level there seems to be a certain stabilization (Gálvez-Fernández et al., 2021).

The causes of such a decrease in this type of trips seem to be related to several sociodemographic factors, where individual, social and environmental aspects exert a direct influence on the possibilities of developing active displacements to schools (Pinto et al., 2017). Therefore, identifying the factors linked to them is fundamental to establishing intervention strategies for their promotion, thus contributing to the health of adolescents through an active lifestyle.

This study analyzes the performance of active transportation to school in a representative sample of adolescents, examining its relationship with various lifestyle habits, physical and psychosocial health indicators, and multiple sociodemographic variables. For this purpose, the performance of active transportation to school, hours of sleep at night, adherence to the Mediterranean diet (MD), PA level, maximum oxygen consumption (VO.max), BMI, health-related quality of life (HRQoL), self-esteem and demographic factors were assessed.

Material and methods

Participants

A cross-sectional study was conducted with a sample of students in the first and fourth years of Compulsory Secondary Education (ESO) in La Rioja. A single-stage cluster sampling was carried out, considering the classrooms corresponding to the aforementioned courses as the sampling unit. A confidence interval of 95%, a precision level of 5%, and a population proportion of 50% were established. Taking into account that the population was 3470 students in the first year of ESO and 2548 in the fourth year of ESO, the representativeness in both years was reached with 346 and 334 students in the first and second years of ESO.

Estimating a participation of 60% and assessing that the average number of students per classroom was 25 in both cases, 23 first-year classrooms and 22 fourth-year classrooms were randomly selected. All the students belonging to the chosen classrooms were invited to participate in the study and, given that the participation rate was 82%, the final sample was made up of 761 adolescents from 45 classrooms belonging to 25 educational centers, of which 383 belonged to to the first course and 378 to the fourth. The ages were between 12 and 17 years old (14.51 ± 1.63 years old), with 49.7% girls and 50.3% boys.

Written informed consent was requested from the parents or legal guardians of the participants. The adolescents' contribution to the research was voluntary and verbally agreed to. The ethical principles of the Declaration of Helsinki were respected. The project was approved by the Clinical Research Ethics Committee of La Rioja. Data collection was carried out between January and June 2018.

Instruments

The assessment of active displacement behavior to school was carried out through the question "Do you go from home to school exercising (walking, cycling, skating...)?" The response was dichotomous in nature (yes or no). Participants were also asked whether they engaged in extracurricular sports activities and, in order to determine the duration of their nocturnal sleep, the time at which they usually went to bed and woke up.

The level of PA was estimated using the Physical Activity Questionnaire for Adolescents (PAQ-A), adapted and validated in Spanish adolescents (Martínez-Gómez et al., 2009). This questionnaire assesses the PA performed in the last seven days, alluding to the type and frequency of the activity performed. The assessment of the questionnaire gives rise to scores between one and five, with higher values indicating a higher level of adherence.

The Mediterranean Diet Quality Index (KIDMED) questionnaire developed by Serra-Majem et al. (2004) was used to analyze adherence to MD. It consists of sixteen dichotomous items (yes or no) related to the consumption of foods associated with the Mediterranean dietary pattern. The final score ranges between minus four and twelve, with higher values denoting greater adherence.

HRQOL was assessed using the KIDSCREEN-27 questionnaire, validated in Spanish adolescents (Aymerich et al., 2005). It is composed of 27 Likert-type items with

five alternatives that score from one to five. The final score was obtained following the instructions described by the authors of the questionnaire, with the highest values corresponding to a more positive perception.

The Rosenberg scale, validated in Spanish adolescents (Atienza et al., 2005), was used to evaluate self-esteem. It is composed of ten items consisting of four possible answers rated between one and four. The final score ranges from ten to forty, with the highest scores being those related to higher self-esteem.

The assessment of the environment for the performance of the PA was performed with the ALPHA environmental questionnaire validated in the Spanish population (García-Cervantes et al., 2014). This questionnaire analyzes, with ten items, the perception of factors in the immediate environment (approximately 1.5 km around the home) that can influence the performance of PA. Once the results were obtained, they were categorized by taking the median as the cut-off point, obtaining two possible environments: favorable or unfavorable.

The Oviedo Infrequency of Response Scale (Fonseca-Pedrero et al., 2009) was used to detect and exclude from the analysis those questionnaires completed randomly, dishonestly or pseudo-randomly. Six items were introduced with elementary and dichotomous (yes or no) responses interspersed throughout the questionnaire (e.g., "Have you ever seen children playing in the park?"). Questionnaires with more than one counterintuitive response were excluded. Specifically, two participants were affected by this circumstance.

As for sociodemographic data, the participants reported their sex, date of birth, nationality, location of the educational center (rural or urban) and ownership (public or subsidized/private). The evaluation of the socioeconomic level (SES) was analyzed with the Family Affluence Scale questionnaire, which consisted of four questions related to the possession of family material goods (Currie et al., 2008). The final score is delimited between zero and nine, making it possible to categorize in: low level (≤ 2), medium level (3-5) or high level (≥ 6). For the treatment of the data, those who reported a low (1.8%) and medium (28%) SES were grouped together, due to the low percentage of the first ones.

Cardio-respiratory capacity (CCR) was assessed using the Course-Navette test. For this purpose, two transverse lines were drawn at a distance of 20 meters marking the beginning and end of the route. The participants must maintain a running pace marked by the acoustic signal indicating the time to run the distance between the two lines successively. The initial running speed is 8.5 km/h, increasing by 0.5 km/h every minute. The test ends when the participants stop or do not complete the route at the marked pace on two consecutive occasions. With the data obtained, the VO.max was calculated using the formula stipulated by the author of the test (Leger et al., 1988).

Height and weight were measured with a Holtain® (Holtain Ltd., Dyfed, United Kingdom) measuring rod with an accuracy of one millimeter and a SECA® scale (713, Hamburg, Germany) with an accuracy of 0.1 kg. Subsequently, BMI was calculated and participants were categorized based on body composition according to the references established by the WHO (Onis et al., 2007): normal weight, overweight or obese.

Statistical analysis

The quantitative variables were represented according to their means and standard deviations, whereas the qualitative variables were represented according to their frequencies. The normality and homoscedasticity of the data were analyzed using the Kolmogorov-Smirnov and Levene tests, respectively. The contrast of means was performed using Student's t-test and Mann-Whitney U test for variables with normal and non-normal distribution, respectively. Pearson's Chi-square test was used to analyze the association between qualitative variables. Likewise, for the correlation analysis, the association was studied using Pearson's and Spearman's correlation coefficients for those variables with normal and non-normal distribution, respectively.

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Results

Table 1 shows the age, hours of sleep at night, Mediterranean diet, physical activity, health-related quality of life, self-esteem and VO.max of the adolescents as a function of commuting to school. The analysis revealed that only PA and MD presented significant differences, showing higher values for students who made active trips to school.

Table 2 shows the analysis of the performance of the commuting to school according to various sociodemographic factors. A total of 33.6% of the adolescents didn't make active trips to school. However, these rates varied according to different factors, being lower among those with a high SES, students from rural and private schools, as well as those living in unfavorable environments for carrying out PA.

Finally, the results of the binary logistic regression concerning active commuting to school are shown in Table 3. Older age and level of PA, residing in an environment favorable for physical activity, studying in schools in urban areas or public schools, and having a low/medium SES were predictors of active commuting to school.

Table 1. Characteristics of the sample based on active commuting to the school

	Active commuting to school (YES) (N=505)		Active commuting to school (NO) (N=256)		*p* value
	M	SE	M	SE	
Age	14.56	1.65	14.41	1.60	0.287
Hours of sleep at night	8.35	0.93	8.38	0.89	0.913
Adherence to Mediterranean diet	7.42	2.11	7.07	2.11	0.030
Physical activity	264	0.62	2.55	0.61	0.047
Health-related quality of life	250.24	32.36	249.86	34.81	0.816
Self-esteem	32.72	4.81	32.62	5.17	0.994
VO_2max	44.45	7.01	43.86	6.50	0.295
BMI	20.71	3.14	21.06	3.48	0.881

Table 2. Sociodemographic factors based on active commuting to the school

		Active commuting to school (YES)		Active commuting to school (NO)		*p* value
		N	%	N	%	
All		505	66.36	256	33.64	
Nationality	Natives	449	66.3	228	33.7	0.950
	Migrants	56	66.7	28	33.3	
Gender	Boys	258	67.4	125	32.6	0.556
	Girls	247	65.3	131	34.7	
Socioeconomic status	Low/Medium	163	71.8	64	28.2	0.038
	High	342	64	192	36	
Location educational center	Urban	379	68.7	173	31.3	0.029
	Rural	126	60.3	83	39.7	
Center ownership	Public	356	73.3	130	26.7	< 0.001
	Subsidized/private	149	54.2	126	45.8	
Environment of PA	Favorable	277	72.3	106	27.7	< 0.001
	Unfavorable	228	60.3	150	39.7	

Table 3. Predictors of active commuting to the school

	B	P value	OR	IC 95%	R^2 Nagelkerke
Center ownership (Public)	0.895	<0.001	2.448	1.763-3.398	0.109
Socioeconomic status (Low/Medium)	0.503	0.006	1.654	1.152-2.374	
Environment of PA (Favorable)	0.424	0.009	1.528	1.109-2.105	
Location educational center (Urban)	0.761	<0.001	1.528	1.109-2.105	
Age	0.121	0.017	1.129	1.022-1.247	
Physical activity	0.281	0.042	1.324	1.011-1.735	

Discussion

The results of the study revealed that 33.6% of the schoolchildren didn't actively commuting to school, rates similar to those found in a previous study with Spanish adolescents in which this percentage was close to 40% (Gálvez-Fernández et al., 2021). In addition, the performance of this type of trips was associated with various sociodemographic variables and lifestyle habits, and some predictor factors could be established.

Firstly, higher levels of PA were associated with higher rates of active commuting to school, consolidating as a predictor factor. The performance of active transportation contributes decisively to compliance with PA recommendations in adolescents, both in intensity and frequency (Kek et al., 2019). In this sense, the performance of PA shared with parents and greater social support of this activity, are key factors capable of predicting the frequency of active transportation by adolescents (Camargo et al., 2020). Similarly, greater enjoyment of PA also seems to contribute significantly to the likelihood of making active trips to school (Wang et al., 2017).

On the other hand, studying in public schools was a predictor of making active trips to school, coinciding with an international study that established that students in public schools were three times more likely to make active transportation to school (Chillón et al., 2009). One of the reasons that could justify this result is the location of the educational centers since, those of public ownership, remain evenly distributed throughout urban areas in order to provide the educational service to the population in a distance ratio close to the residence, which could make it possible to a greater extent to walk, since distance turns out to be a key factor in this type of commuting (Rodríguez-Rodríguez et al., 2017). Other research has highlighted that, regarding active displacements to school, parents' perceptions of personal, environmental and safety barriers increase as the distance to the educational center increases (Mandic et al., 2020), reinforcing the previous justification.

Likewise, students from urban centers showed higher rates of active transportation, consolidating as a predictor factor. Similar results were found in adolescents from southern Spain, again pointing to distance as a key aspect in the desire to walk to the educational center (Rodríguez-López et al., 2017). Furthermore, the number of barriers observed to carrying out active commuting by adolescents in rural areas seem to be more numerous; especially those associated with the built environment, such as, for example, the availability of bicycle paths (O'Loghlen et al., 2011). Therefore, the greater availability of resources for active transportation in urban areas, as well as shorter distances between school and home, could explain a lower frequency of active commuting by rural adolescents (Christiana et al., 2021). These same reasons could justify the predictive role of the environment, since residents in favorable environments for practicing PA presented higher rates in such trips, ratifying that greater accessibility, as well as better infrastructures aimed at favoring the walkability and safety of the neighborhoods, have a direct impact on the population's activity levels (Smith et al., 2017).

SES also proved to be a predictor factor, with those with a low/middle SES presenting a higher frequency of active trips. The realization of this type of displacements in developed countries seems to be higher by those with lower SES (Oyeyemi & Larouche, 2018) and neighborhoods with lower economic resources (Molina-García et al., 2017). The lower access and availability of low-income families to motorized vehicles could justify the greater realization of more active journeys by children to school (Silva et al., 2018). In addition, making active trips to school depends in part on the independent mobility of schoolchildren, being higher in those families with lower income and lack of available vehicles to accompany their children to school (Larouche et al., 2020; Rodríguez-Rodríguez et al., 2021).

Finally, age was also a predictor for carrying out active transportation, with older adolescents having higher usage rates, coinciding with a previous study in which it was concluded that the use of bicycles to go to school increased steadily as age increased (Cardon et al., 2012). The justification for these results could be due to young people's own maturational development, where autonomy and independence take on greater relevance among older people (Simons et al., 2013). Similarly, the perception of the neighborhood by both the family and the adolescents seems to be more positive as their age increases, with improvements in key aspects such as safety, connectivity or the availability of infrastructure for walking or cycling (D'Haese et al., 2015).

In addition to the predictive factors described above, those adolescents who used active transportation to school showed greater adherence to the MD. Active transportation is considered a key domain for adherence to PA recommendations (Diolintzi et al., 2019), and the associations found in previous studies between such PA, sedentary habits and dietary patterns could justify the aforementioned association (Idelson et al., 2017). Specifically, the performance of PA is linked to a higher consumption of fruits, vegetables, fish and nuts (Chacón et al., 2018). In this sense, the influence of parents in the creation of adolescent habits is essential, since the family environment has a high potential in the promotion of healthy behaviors, transmitting knowledge, facilitating the necessary resources and motivating compliance with them in order to consolidate an active lifestyle in their children (Hamilton et al., 2020).

It is worth mentioning that one of the main strengths of the study is the obtainment of a representative sample of adolescents, allowing a global analysis of the association between active transportation and different lifestyle habits, physical and psychosocial health indicators and sociodemographic factors, as well as the determination of predictors of the absence of active transportation. However, there are limitations in the study, since most of the data obtained came from self-completed questionnaires that could be subject to the subjectivity of the participants, although all the instruments used showed high reliability and validity in previous studies with similar populations. In any case, the use of instruments such as accelerometers or diet records could provide greater objectivity to the results. On the other hand, a cross-sectional design was used, making it impossible to establish causal relationships, so future longitudinal studies could complement the results obtained.

Conclusions

Being older, studying in urban or public schools, residing in environments favorable for PA, having a low/middle SES, and having lower levels of PA were found to be predictors of active transportation to school. Likewise, such active transportation reported positive associations with MD. The results obtained reveal the importance of sociodemographic variables in the performance of active transportation and, given the influence that these have on the health status of adolescents, interventions aimed at their promotion should consider the predictors described in the results. In this sense, in addition to encouraging programs that promote confidence, safety and road safety education among schoolchildren, it is essential to provide a greater number of roads and infrastructures that facilitate active commuting to school, especially in the most vulnerable contexts, such as rural areas or environments that are less favorable for PA.

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