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Socioeconomic, Personal and Behavioral Correlates of Active Commuting among Adolescents

Adilson Marques
University of Lisbon, Interdisciplinary Centre for the Study of Human Performance, Faculty of Human Kinetics, Lisbon, Portugal
Miguel Peralta
University of Lisbon, Faculty of Human Kinetics, Lisbon, Portugal
Hugo Sarmento
Centre for the Study of Education, Technologies and Health, CI&DETS, School of Education – Polytechnic of Viseu, Viseu, Portugal
University Institute of Maia, Research Center in Sports Sciences, Health Sciences and Human Development, CIDESD, ISMAI, Portugal
João Martins
University of Lisbon, Pedagogy Laboratory, Faculty of Human Kinetics and Investigation and Development in Education and Formation Unity, Institute of Education, Lisbon, Portugal
Lusófona University of Humanities and Technologies, Faculty of Physical Education and Sport, Lisbon, Portugal
Francisco Carreiro da Costa
University of Lisbon, Interdisciplinary Centre for the Study of Human Performance, Faculty of Human Kinetics, Lisbon, Portugal
Lusófona University of Humanities and Technologies, Faculty of Physical Education and Sport, Lisbon, Portugal

ABSTRACT

The aims of this study were to assess the relationships between commuting to and from school (active vs. passive) and their explanatory variables. A total of 2653 adolescents (1361 boys, 1292 girls; M age=13.4±2.6) participated in this study. The students were questioned about commuting to and from school, physical activity and school sports participation and perceptions of competence and health. Socioeconomic status and body mass index were calculated. Results show that a minority of the students use active transportation to and from school. Also, age increasing, participation in school sports and increasing duration were positively correlated with active commuting for both routes (to and from school). Given that active commuting may be a simple and effective way to increase physical activity level among youth populations, it is important to promote, improve conditions and create strategies in order to increase the number of students that actively commute to and from school.

Key words: *Active commuting, passive commuting, students, correlates.*

Introduction

Regular physical activity (PA) in adolescence is associated with several health benefits (Janssen & LeBlanc, 2010). In spite of benefits related to PA, research shows that adolescents are not active enough to benefit their health (Baptista et al., 2012). This high prevalence of physical inactivity is a cause of concern. Walking and cycling to and from school are opportunities to improve children's and adolescents' PA levels, as has been previously observed (Tudor-Locke, Ainsworth, & Popkin, 2001). Thus, promoting active commuting to school not only reduces an inactive behavior (passive commuting), but replaces it with a moderate intensity activity (Alexander et al., 2005). Children who walk to school have higher energy expenditure (Tudor-Locke, Ainsworth, Adair, & Popkin, 2003), engage more in PA (Cooper, Page, Foster, & Qahwaji, 2003), and are more likely to meet PA guidelines (Tudor-Locke, Neff, Ainsworth, Addy, & Popkin, 2002) than children who travel to school by a passive way of transportation.

Influences on the choice to walk or cycle to school are complex and include a range of personal, social and environmental factors (Salmon, Salmon, Crawford, Hume, & Timperio, 2007; Timperio et al., 2006). These factors can be systematized as non-modifiable and modifiable. The non-modifiable factors, such as gender, age and socioeconomic status (SES), help in identifying groups using active transportation. On the other hand, modifiable factors can be used to guide design intervention programs such as perceptions of competence (Van der Horst, Paw, Twisk, & Van Mechelen, 2007), perception of health (Ledent, Cloes, & Piéron, 1997) and of weight status, and PA participation.

Despite the number of studies about the correlates of active commuting, there is little information about Portuguese adolescents. To the best of our knowledge, we found only one study on this and it was only focused on girls (Mota et al., 2007). Therefore, the aim of this study was to analyze the correlates of active and passive commuting to and from school.

Methods

Participants

The participants were 2653 adolescents (1361 boys, 1292 girls) aged 10-18 years (M age=13.4±2.6), attending from grade 5 to 12. Adolescents were from six Portuguese public schools randomly selected in the urban area of Lisbon. The choice of these schools was based on the fact that they are on locations that cover different socioeconomic levels, as well as different numbers of facilities nearby for the practice of PA. An informed written consent was obtained from the students and their legal guardians. The study was conducted according to ethical standards in sport and exercise science research (Harriss &

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Atkinson, 2011) and the protocol received approval from both the Ethics Committee of the Faculty of Human Kinetics of the University of Lisbon and the Portuguese Minister of Education.

Commuting to and from school

Students reported how they usually travelled to and from school on most days. Four possible responses were provided (walk, bike, car, bus/tram/train). Afterwards, the answers were dichotomized into active traveller (walk or bike), non-active traveller (car, bus/tram/train). The trip duration were classified on 6-points scale from "less than 5 minutes" to "more than 30 minutes" and cut into 5-minute interval.

Physical activity and school sport participation

A questionnaire developed by Piéron et al. (1997) was used to determine students participation in organized PA (OPA), participation in non-organized PA (NOPA), and participation in school sports (SS). Studies using this questionnaire with Portuguese students were published previously (Marques & Carreiro da Costa, 2013), as well as were the validation procedures (Mota, Almeida, Santos, Ribeiro, & Santos, 2009)

Body mass index

The measurement of height was made using a stadiometer (recorded to the nearest 0.5 cm). For the measurement of weight subjects were wearing shorts and a t-shirt, without shoes (recorded to the nearest 0.5 kg). Body mass index (BMI) was then calculated divided by height (square meters). Adolescents BMI classification was determined based on International Obesity Taskforce criteria (Cole, Bellizzi, Flegal, & Dietz, 2000), with overweight defined as an adult BMI equivalent ≥ 25 according age and sex.

Socioeconomic status

SES was calculated based on parental occupation and educational level. Parents' occupation titles were regrouped in order to classify the subjects as lower, middle, and higher class. The lower class included skilled and unskilled manual workers, farmers, and fishermen; the middle class included service occupations such as nonprofessional health service workers, office clerks, and sales people; the higher class consisted of business-owners, executives, university-educated specialists and professionals (Raudsepp & Viira, 2000).

Perceptions

Lintunen's scale was used to measure students' perceived physical competence (Lintunen, 1990). The 6-items, using a 5-point Likert scale, displayed a good internal consistency (= 0.9). Perception of health was assessed with a selection on a 4-point scale ranging from ''I am not feeling well'' (= 1) to ''I am very healthy'' (= 4).

Data analysis

Descriptive statistics were calculated (means, standard deviation and percentages) for all variables. Chi-square and Student t-test were used to assess differences between active and passive commuting to and from school. The effects of each independent variable on the transportation were assessed by a binary logistic regression. Adjusted odds ratio (OR) with 95% confidence intervals (CI) was calculated. Adjustments were performed for all studied variables. An OR greater than 1 reflects an increased likelihood of active transportation. All statistical analyses were performed using IBM SPSS Statistics 22.0. The level of significance was set at 0.05.

Results

The general sample's characteristics are presented in Table 1. Overall, 27% and 34.4% of the sample use an active mode of travel to commute to and from school respectively. The mean duration of these trips were 12.3±7.2 minutes from home to school and 14.2±7.7 minutes from school to home. More than half of the respondents were from a middle/high social class (74.7%) and 22.5% were overweight. Table 1 also shows the data regarding perceptions (competence and health) and PA participation in different contexts.

Table 1. General Characteristics of the Studied Population

Variables	N	% or M±SD
Gender		
Boys	1361	51.3
Girls	1292	48.7
Age	2631	13.4±2.6
Socioeconomic status		
Lower	644	25.2
Middle	1198	46.9
Higher	711	27.8
BMI		
Normal weight	1716	77.5
Overweight	498	22.5
Transportation (home to school)		
Active	715	27.0
Passive	1938	73.0
Transportation (school to home)		
Active	913	34.4
Passive	1740	65.6
Duration (home to school)	2649	12.3±7.2
Duration (school to home)	2642	14.2±7.7
Physical activity participation		
Organized physical activity	1494	59.1
Non-organized physical activity	1322	52.3
School sports	460	17.6
Perceptions		
Perception of competence	2628	3.5±0.8
Perception of health	2653	3.0±1.0

Legend: BMI - body mass index

Table 2. The Characteristic of Subjects That Use an Active or Passive Commuting from/to School

	Transportation (home to school)			Transportation (school to home)		
Explanatory variables	Active n (%)	Passive n (%)	*p*	Active n (%)	Passive n (%)	*p*
Gender			0.046			0.046
Boys	344 (48.1)	1017 (52.5)		444 (48.6)	917 (52.7)	
Girls	371 (51.9)	921 (47.5)		469 (51.4)	823 (47.3)	
Age	13.4±2.4	13.3±2.6	0.008	13.5±2.4	13.3±2.7	<0.001
Socioeconomic status			0.302			0.552
Lower	185 (27.2)	459 (24.5)		211 (24.0)	433 (25.9)	
Middle	317 (46.6)	881 (47)		417 (47.4)	781 (46.7)	
Higher	178 (26.2)	533 (28.5)		252 (28.6)	459 (27.4)	
BMI			0.492			0.788
Normal weight	449 (76.5)	1267 (77.9)		585 (77.2)	1131 (77.7)	
Overweight	138 (23.5)	360 (22.1)		173 (22.8)	325 (22.3)	
Duration	11.1±6.1	12.8±7.5	<0.001	13.1±6.9	14.8±8.1	<0.001
Organized PA			0.849			0.891
No	278 (40.6)	758 (41.1)		353 (40.8)	683 (41)	
Yes	406 (59.4)	1088 (58.9)		513 (59.2)	981 (59)	
Non-organized PA			0.167	408 (47.1)		0.645
No	342 (50.0)	866 (46.9)		458 (52.9)	800 (48.1)	
Yes	342 (50)	980 (53.1)			864 (51.9)	
School sports			0.004			0.019
No	555 (78.8)	1592 (83.7)		717 (79.9)	1430 (83.6)	
Yes	149 (21.2)	311 (16.3)		180 (20.1)	280 (16.4)	
Perceptions						
Perception of competence	3.5±0.8	3.5±0.7	0.032	3.5±0.8	3.5±0.7	0.199
Perception of health	3.1±1.0	3.0±1.0	0.557	3.1±0.9	3.0±1.0	0.823

Legend: BMI - body mass index; PA - physical activity

Table 2 shows the relationship between socio-demographic and psychosocial characteristic and commuting to and from school. For the gender, significantly more girls (51.9%) than boys (48.1%) commuted to school actively (p=0.046). The same was also observed from the route school to home (51.4% vs. 48.6%, p=0.046). The prevalence of active transportation to and from school increases slightly but significantly with age (p=0.008, p<0.001). The SS participation was also related with commuting to and from school, as the active transportation group had higher percentages of adolescents that participated in SS than the passive transportation group, to school (21.2% vs. 16.3%, p=0.004) and from school (20.1% vs. 16.4%, p=0.019). SES and participating in organized and non-organized PA were not related with active transportation to and from school.

Table 3. Adjusted Odds Ratio for Active Commuting from/to School

	Home to school	School to home
Explanatory variables	Adjusted OR (95% CI)	Adjusted OR (95% CI)
Gender		
Girls	1.00 (ref.)	1.00 (ref.)
Boys	0.844 (0681-1.046)	0.82 (0.67-1.01) †
Age	1.06 (1.02-1.11)**	1.08 (1.04-1.12)***
Socioeconomic status		
Lower	1.00 (ref.)	1.00 (ref.)
Middle	0.88 (0.68-1.13)	1.09 (0.86-1.38)
Higher	0.72 (0.55-0.96)*	1.02 (0.78-1.32)
BMI	0.89 (0.69-1.15)	0.89 (0.70-1.13)
Duration	0.96 (0.94-0.97)***	0.96 (0.95-0.98)***
Organized PA participation		
No	1.00 (ref.)	1.00 (ref.)
Yes	1.05 (0.84-1.31)	1.00 (0.81-1.23)
Non-organized PA participation		
No	1.00 (ref.)	1.00 (ref.)
Yes	0.93 (0.76-1.14)	1.08 (0.89-1.31)
School sports participation		
Yes	1.00 (ref.)	1.00 (ref.)
No	0.77 (0.58-1.03) †	0.76 (0.58-0.99)*
Perception of competence	1.19 (1.02-1.39)*	1.10 (0.95-1.28)
Perception of health	0.97 (0.86-1.08)	0.99 (0.89-1.10)

Legend: BMI - body mass index; PA - physical activity; †p<0.1; *p<0.05; **p<0.01; ***p<0.001

Table 3 presents the results of the regression analysis for the correlates of active commuting. Age (OR=1.06, CI: 1.02-1.11, p<0.01; OR=1.08 CI: 1.04-1.12, p<0.001), participation in SS (OR=0.77 CI: 0.58-1.03, p<0.1; OR=0.76 CI: 0.58-0.99, p<0.05) and duration (OR=0.96, CI: 0.94-0.97, p<0.001; OR=0.96, CI: 0.95-0.98, p<0.001) were found as correlates of active commuting for both routes (to and from school). In fact, being older and participating in SS increases the probability of engaging in active commuting, while longer travel durations decreases the probability of engaging in active commuting, to and from school. Concerning the route from home to school, having higher SES represents less probability for active commuting than having lower SES (OR=0.72, CI: 0.55-0.96, p<0.05) and having a better perception of competence presents a higher probability of engaging in active commuting (OR=1.19, CI: 1.02-1.39, p<0.05). For the school to home route, being a girl presents higher probability of engaging in active commuting (OR=0.82, CI: 0.67-1.01, p<0.1).

Discussion

The present study examined the correlates of active commuting in a sample of Portuguese adolescents. The results show that a minority of the students use active transportation to and from school. However, as in previous study (Leslie, Kremer, Toumbourou, & Williams, 2010), more students engaged in active commuting for the route from school to home than for the route from home to school. To understand this result we have to consider typical day of school and work. Whereas both have the same opening time (8 o'clock), they differ in the closing time (16 o'clock for school day and 18 o'clock for most work days). It is possible that parents find easier to leave their children in school than to take them home after school, due to work and school schedule.

Students from high SES significantly presented less probability to engage in active commuting. This might be related with money availability, increasing the likelihood of owning a car per family (Prentice & Jebb, 1995). Access to motorized vehicles was associated with passive commuting for university students (Molina-Garcia, Castillo, & Sallis, 2010) and among United Kingdom adults (Adams, 2010), what could affect children if they were taken to school by their parents or family members. Also, higher parental education was associated with reduced odds of walking to school (Evenson, Huston, McMillen, Bors, & Ward, 2003). As a result, the difference between higher and lower SES students, who actively commute to and from school, could be explained by the possibility for children among higher SES to be driven to school (passive commuting) by their parents or family members in the morning, and come back home by walking or cycling (active commuting), because their parents are still at work.

The present study found that girls were significantly more active than boys in their way of travel. However, this outcome was in contrast to the findings of Timperio (2006), Robertson-Wilson et al. (2008) and Larsen et al. (2009). The precocity of girls could explain their higher representation among active travellers.

Concerning the age, the adolescents using an active way of travel were significantly older than those using a passive way of travel, as being older were significantly associated with engagement in active commuting. These results are understandable and corroborative with the increasing autonomy that comes with age increasing, which characterizes this period of life. Furthermore, this explanation can be strengthened by the results on the perception of competence, where students with higher perception of competence had higher odds to engage in active commuting. It is possible that perception of competence increases with age, and together with increasing autonomy this could lead to engagement in active commuting. The findings of physical perception of competence as a significant correlate of active transportation are in concordance with an Australian study of active transport to and from university (Shannon et al., 2006).

Most studies used as variable the distance between home and school (Panter, Jones, van Sluijs, & Griffin, 2010; Timperio et al., 2006). However, in this study the variable of interest was the travel duration. This variable was significantly correlated with active commuting. Indeed, students were more likely to actively travel to and from school if the travel duration was shorter. These results confirmed those of previous studies using the variable distance (Larsen et al., 2009; Robertson-Wilson et al., 2008).

A positive association between active commuting and participation in SS were found. Previous studies found a relationship between PA participation and engaging in active commuting (Larouche, Saunders, Faulkner, Colley, & Tremblay, 2014; Robertson-Wilson et al., 2008), which could be accordingly to these study findings, as SS is a form of organized PA.

Walking to school was associated with higher school-day steps in older children. The proportion of children who met recommended step thresholds was higher in those who actively commute compared with those who passively commute (Abbott, Macdonald, Nambiar, & Davies, 2009). Given that active commuting may be a simple and effective way to increase PA level among youth populations, it is important to promote, improve conditions and create strategies in order to increase the number of students that actively commute to and from school.

Some study limitations should be mentioned. Causal relationships cannot be inferred from this cross sectional data. Another limitation of the study is the reliance on self-report measures. However, we note that the main strength of this study is the large sample that achieves significant results. To the best of our knowledge it is the biggest study on this subject among Portuguese adolescents.

For future studies, in order to promote active travel to school, it is important to consider school and district policies as well as attitudes of school and district administrators. This is another area of research that would better understand school policies promoting active travelling. Combined with the results of this study, we could redirect campaigns to target people by adjusting the proposals.

Disclosure of conflicts of interest

The authors declare that there are no conflicts of interest. Moreover, authors have no relevant financial or nonfinancial relationships to disclose.

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M. Peralta
University of Lisbon, Faculty of Human Kinetics, Estrada da Costa, 1499-002 Cruz Quebrada, Lisbon, Portugal
e-mail: miguel.peralta14@gmail.com