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ORIGINAL

ACTIVE COMMUTING IN ADOLESCENTS: IMPORTANCE OF PERCEIVED BARRIERS AND ACCOMPANIMENT

DESPLAZAMIENTO ACTIVO EN ADOLESCENTES: IMPORTANCIA DE LAS BARRERAS PERCIBIDAS Y EL ACOMPAÑAMIENTO

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ABSTRACT

The present study aims to know the predictive value of age, accompaniment, and physical and psychosocial barriers in active commuting. A total of 1,325 students from Primary Education and Secondary Education centers of the Autonomous Community of Extremadura (Spain) participated, with ages between 10-17 years (*M* =12.1; *SD* = 1.60). The students filled in information on

the mode, distance, time and accompaniment through the PACO questionnaire, and the perceived barriers to active displacement using the BATACE scale. The results showed a significant incidence of accompaniment, distance, and perceived psychosocial barriers for active travel to school (R2 = .53; p = 0.00). It concludes on the importance of distance to the educational center, psychosocial barriers, and accompaniment as the most important elements in the realization of active displacement.

KEYWORDS: active commuting, perceived barriers, environment, accompaniment, adolescents

RESUMEN

El presente estudio tiene como objetivo conocer el valor predictivo de la edad, el acompañamiento, y las barreras físicas y psicosociales en el desplazamiento activo. Participaron un total de 1325 estudiantes procedentes de centros educativos de Educación Primaria y Educación Secundaria de la Comunidad Autónoma de Extremadura (España), con edades comprendidas entre los 10-17 años (*M* =12.1; *DT* = 1.60). Los estudiantes cumplimentaron información sobre el modo, distancia, tiempo y acompañamiento a través del cuestionario PACO, y de las barreras percibidas para el desplazamiento activo mediante la escala BATACE. Los resultados revelaron una importante incidencia del acompañamiento, la distancia y las barreras psicosociales percibidas para la realización de desplazamiento activo hacia el colegio (R^2 = .53; *p* = 0.00). Se concluye en la importancia de la distancia hasta el centro educativo, las barreras psicosociales, y el acompañamiento como elementos más importantes en la realización de desplazamiento activo.

PALABRAS CLAVE: Desplazamiento activo, barreras percibidas, entorno, acompañamiento, adolescentes

INTRODUCTION

Active commuting is defined as the action of going to the school by means of transportation that entails a metabolic expense such as walking or using bicycles (Chillón et al., 2010). This type of movement contributes significantly to increased physical activity (Larouche, Saunders, Faulkner, Colley, and Tremblay, 2014). Similarly, active commuting has been shown to have a positive impact on physical and psychosocial health (Ramanathan, O'Brien, Faulkner, and Stone, 2014), promoting the reduction of overweight and obesity levels (Saunders, Green, Petticrew, Steinbach, and Roberts, 2013), as well as improving the feeling of well-being, subjective happiness, and cognitive development (Bonet, Parrado, and Capdevilla, 2017; Holder, Coleman, and Sehn, 2009; Van Dijk et al., 2014). Moreover, it also has a positive impact on the environment through reducing traffic congestion, lowering gas emissions, and reducing noise in cities (Kamruzzaman, Hine, and Yigitcanlar, 2015). According to the ecological model of healthy behaviors (Sallis, Fisher, and Owen, 2006) the factors that interact in the performance of active commuting of

include those related to the individual level sphere and those associated with the social and physical environment. In this regard, the type of neighborhood is an important factor in relation to active commuting (Veitch et al., 2017). Important studies correlate the characteristics of the neighborhood (safety, distance and pedestrian crossing) with the frequency of active commuting, highlighting the importance of the perception of safety, comfort and complexity of the environment in the choice of the route (Panter, Jones, and van Sluijs, 2008; Shatu, Yigitcanlar, and Bunker, 2019). Similarly, the conceptual framework developed by Mandic et al. (2015) points out that there are three factors (personal, social and environmental) that promote active commuting. On a personal level, age (Pabayo, Gauvin, and Barnett, 2011), gender (Babey, Hastert, Huang, and Brown, 2009), and the number of vehicles in the household (McDonald, 2008). At a social level, a low socioeconomic status (Babey et al., 2009) and peer support (Mandic et al., 2015). Finally, at an environmental level, distance is an important element for active travel to school (Mandic et al., 2015). On the other hand, with regard to parental safety, the perception of parents about the environmental context has been associated with physical activity in general (Henne, Tandon, Frank, and Saelens, 2014). Carver et al. (2010), points out that parental perception is negatively associated with active commuting due to parental concerns related to the mode of transportation (Panter et al., 2008), showing rejection of young people walking or cycling to school. Similarly, the volume of traffic and crime related to security are other reasons why the perception of parents is negatively associated with active commuting (Huertas-Delgado et al., 2018; Vander Ploeg et al., 2013). In this regard, Wilson et al., (2018) point out that parents perceive more barriers than children and attribute this fact to the fact that many parents consider taking their children to school as part of their travel to work (Shaw et al., 2013). Thus, it is important to highlight the relevance of the accompaniment factor in active commuting (Ghekiere et al., 2016; Hillman, Adams, and Whitelegg, 1990).In this sense, Chillón et al. (2013), point out that active commuting rates have declined in recent years. These travel rates are determined by the perception of barriers such as the distance from home to school (Davison, Werder, and Lawson, 2008). In accordance to this, Carver, Timperio, and Crawford, (2013) showed that 47% of parents who took their children by car were due to the distance to the school. Likewise, the minors who had the highest rates of active commuting were also those with the lowest perceptions of safety (Herrador-Colmenero, Villa-González, and Chillón, 2017).

Therefore, the present research aims to test the relationships between the different types of perceived barriers (environment, security, and psychosocial) with active commuting. And, in addition, consider the predictive value of age, accompaniment, and perceived barriers to active commuting. Likewise, it is believed that time and distance were positively related to the perception of barriers. Likewise, the behavior of active commuting will be predicted by age, accompaniment, and the perception that each participant has about their environment and barriers.

METHOD

Participants

The present study consists of a cross-sectional correlational design. 1325 students from different schools of the Autonomous Community of Extremadura, Cáceres, Spain, participated in the study. In this regard, 742 students came from Primary Education schools, and 583 from Compulsory Secondary Education schools, aged between 10-17 years. (*M* =12.15 ± 1.60), boys (*n* = *747* 56.4% ; *M* =12.1 ± 1.64), and girls (n = 578 43.6% ; *M* =12.16 ± 1.56) The sample selection process was carried out through an intentional random sampling according to the availability of the schools to collaborate, and the availability of the researcher to travel to the schools in order to collect the data.
Instruments

Active Commuting. It was obtained by completing the PACO (Pedal and go to school) self-reported questionnaire from the University of Granada (Profith, 2016). This instrument assesses the type of commuting. How are you doing? How do you get back? For each day of the week. The responses were categorized into active if the participant made the travel on foot or by bike, or passive if the travel was developed was made in a motorized vehicle. Likewise, active commuting was calculated through the number of commutes (≥ 8) actively performed (Herrador-Colmenero, Escabias, Ortega, McDonald, & Chillón, 2019).

Environmental barriers. It was evaluated through four self-reported items of the PACO questionnaire (Pedal and go to school) from the University of Granada (Profith, 2016), which refer to the barriers that participants can perceive with respect to the environment where they live. The items begin with the sentence *The area where I live* ... followed by the item, (offers a pleasant environment for walking; the buildings are clean and without graffiti, there are quite a few trees on the street, poorly maintained buildings). The responses ranged on a four-point Likert-type scale from 1 (*strongly disagree*) to 4 (*strongly agree*).
Barriers to active commuting to the school. It was assessed through the BATACE scale (Spanish acronym for Barriers in Active Commuting to School) and translated as Barriers to Active Commuting to School (Molina-García, Queralt, Estevan, Álvarez, and Castillo, 2016). This scale was based on the original work of (Forman et al., 2008). Likewise, this scale is made up of 18 items that make up two factors: environmental and safety barriers (eleven items, i.e., “it is too far”, α = .70), and planning and psychosocial barriers (seven items , i.e. “it is easier to go by car”, α = .70). All items were evaluated through a four-point Likert scale with ranges from 1 (totally disagree) to 4 (totally agree).
Accompaniment. It was assessed by means of a self-reported item that asked "Are you going alone or with someone to the school?" The answer options were three: 1 (with adults), 2 (alone), 3 (with other minors).

Procedure

The present study has been developed through several phases. Firstly, a list of potential schools that could be open to participate in the research was conducted. Subsequently, an appointment was made with the management team to explain what the object of study would be and that the identity of the participants would not be compromised. Once permission was obtained from the schools, informed consent was delivered to request parental permission and approval, explaining the objective of the study and the variables to be assessed. The study was previously approved by the Ethics Committee of the University of Extremadura "145/2019". All participants were treated according to the ethical principles and codes of conduct of the American Psychological Association, (2010) for this type of research. The test consisted of completing a questionnaire in approximately 20 minutes, where the main researcher was present in case there was any doubt.

Data Analysis

For data analysis, the statistical package SPSS v.23 was used. Descriptive statistics were performed for the sociodemographic characteristics according to the condition of the participants to develop active commuting or not. Moreover, the normality tests suggested the use of non-parametric tests k-s = $p > 0.05$, so the associations made were carried out through the Spearman Rho value, in order to assess the degree of relationship between variables. Subsequently, a binary logistic regression analysis was performed. In this sense, the analysis conducted led a stepwise model forward in order to predict active commuting.

RESULTS

Table 1 shows the sociodemographic characteristics regarding those participants who carry out active commuting and those who do not. The statistics analysis show that there are differences in age, accompaniment, time and distance in the travel with respect to the performance of the active commuting. Similarly, it is shown that there are no gender differences for the performance of active commuting.

Table 1. Sociodemographic characteristics of the study participants.

		Active (*n* = 465)	Inactive (*n* = 860)	Total	*p*
Gender	Boys	268	479	747	.48
	Girls	197	381	578	
Age	< 12 years	204	538	742	.00
	>12 years	261	322	583	
Accompaniment	Adults	154	714	868	.00
	Peers	196	109	305	
	Alone	115	37	152	
Distance to school (m)	< 500	220	87	307	.00
	500-1500	151	220	371	
	1500-3000	87	274	361	
	3000-6000	6	160	166	
	> 6000	1	119	120	
Time in the Active Commuting (min)	< 5’	203	184	387	.00
	5’-15’	202	459	661	
	15’-30’	59	1190	249	
	30’-60’	1	27	28	
	>60	-	-	-	

Note. *p < 0.05; ** p < 0.01

Spearman's correlation analysis (Table 2) showed significant positive associations between the variables of distance and time in active commuting, in relation to safety barriers (r = .34; p <0.01) and psychosocial (r = .22 ; p <0.01). Likewise, the significant negative relationship between distance and the quality of the environment stands out (r = -.06; p <0.05), which refers to the fact that a greater distance from the school is related to a worse perception of the environment. In the same way, time spent traveling was positively associated with a greater perception of vandalism in the streets (r = -.05; p <0.05).

Table 2. Correlation analysis between time and distance for active movement and perceived barriers.

	Boys	Girls	Total	*P*	1	2	3	4	5	6	7	8
Distance to school(1-5)	2.59±1.26	2.51±1.17	2.56±1.22	.40	-	.49**	.04	-.00	.00	-.06*	.34**	.22**
Tieme in the travel (1-5)	1.89±.74	2.00±.74	1.93±.74	.00	-	-	-.01	.05*	-.01	-.01	.22**	.13**
Pleasant neighborhood atmosphere (1-4)	3.34±.83	3.39±.75	3.36±.79	.55	-	-	-	.04	.24**	.07*	-.10**	-.06*
Delinquency (1-4)	2.37±1.09	2.41±1.03	2.39±1.06	.41	-	-	-	-	.11**	-.21**	-.00	.02
Parkland (1-4)	2.92±.95	3.03±.91	2.97±.93	.04	-	-	-	-	-	-.11**	-.02	-.02
Clean buildings (1-4)	3.10±1.11	2.98±1.17	3.05±1.14	.09	-	-	-	-	-	-	-.12**	-.14**
Batace 1 (1-4)	1.98±.54	2.02±.50	2.00±.52	.10	-	-	-	-	-	-	-	.56**
Batace 2 (1-4)	2.15±.63	2.22±.63	2.18±.63	.04	-	-	-	-	-	-	-	-

Note. *p < 0.05; ** p < 0.01; Batace 1: Safety Barriers; Batace 2: Psychosocials Barriers. *P:* Value of the contrasts with respect to sex performed through the Mann-Whitney U test

Importance of age and accompaniment in active commuting

Table 3 shows the binary logistic regression analysis performed to assess the predictive value of age, accompaniment, and physical and psychosocial environmental barriers in active commuting. In this sense, the regression analysis shows an automatically generated model, with 5 steps, through the step-forward method where the age variable was automatically deleted (p = 0.67). The value of the omnibus test of the model revealed significance (p <0.05) in all the components that make up the stepwise regression. In the first step of the model, it was composed of the accompaniment variable, step two integrated the distance to the school, step three added the psychosocial barriers (Batace 2), step four added the parklands, and finally step five integrated the environmental barriers (Batace 1). The summary of the model explains 54.3% of the variance of the dependent variable (R2 = .543). Likewise, there is a value of 0.57 times more likely to develop active commuting accompanied by other minors/peers than going alone or with adults.

Table 3. Logistic regression to carry out active commuting

Regression Model					
Omnibus test on the models´ coefficient					
	X^2	gl	*P*		
Step 1	322.17	1	.00		
Step 2	607.40	2	.00		
Step 3	649.03	3	.00		
Step 4	658.19	4	.00		
Step 5	664.08	5	.00		
Model Summary					
	-2 log likelihood	R^2 de Cox y Snell	R^2 Nagarkelke		
Step 1	1384.10	.22	.30		
Step 2	1109.87	.36	.50		
Step 3	1068.24	.38	.53		
Step 4	1059.07	.391	.539		
Step 5	1053.19	.394	.543		
Variables in the equation					
	B	SE	Wald	*p*	Odds Ratio (Exp B)
Step 5					
Distance	-1.06	.08	156.72	.00	.343
Parklands	-.24	.08	9.44	.00	.774
Batace 1	-.45	.19	5.82	.01	.629
Batace 2	-.68	.15	18.30	.00	.517
Accompaniment		.			
A. (adults)	-2.26	.25	108.87	.00	.108
A. (minors)	-.55	.26	4.31	.03	.574

Note. *p < 0.05; ** p < 0.01; Batace 1: Safety Barriers; Batace 2: Psychosocials Barriers; A. (adults) = accompaniment with adults; A. (minors) = accompaniment with minors or peers.

DISCUSSION

The present research aimed to examine the relationships produced between distance and time, the environment, and the perceived physical and psychosocial barriers to active commuting. Moreover, it was proposed to assess to what extent age, accompaniment, environment, and perceived barriers promote active commuting. In this sense, it was hypothesized that travel time and distance would be significantly positively associated with both the perception of physical and psychosocial barriers.

The results showed significant positive associations between distance and time for active travel with perceived physical and environmental barriers. These results are consistent witho those found by Carver et al., (2013); Davison et al., (2008), where the existing distance from home to school is a significant barrier to active commuting. In this regard, Orzanco-Garralda et al. (2018) point out that the decision not to actively travel is related to lack of time, and add that carrying out daily activities that involve active commuting could contribute to an increase in physical activity. In the same way, other studies have pointed out the importance of the climate as an indicator for the choice of the mode of

transport (Knowles, 2012). Traffic volume is another important characteristic related to active travel. In this sense, Feuillet et al. (2015), indicate that a low population density is related to a strong sense of security.

Regarding the associations produced with psychosocial barriers, Ikeda et al. (2019) notes that active commuting is an opportunity to improve social interactions while increasing the amount of daily physical activity. One possible explanation is that both the distance and the time that active commuting is invested are key aspects positively related to a greater perception of barriers. In this sense, authors suggested that active commuting among young adolescents is determined by personal factors, family and environment, preferences, limitations and characteristics of the destination. (Mandic et al., 2015). Enjoyment, personal health, the environment, discomfort and knowledge of safe routes also play a role (McMillan, 2005).

On the other hand, regarding the incidence of age and the accompaniment for the realization of active commuting, our results, obtained through stepwise logistic regression, suggest that age is not a determining element for the performance of active commuting. A possible explanation for this fact may be due to the fact that as children grow older and enter adolescence, the levels of physical activity decrease, having more impact on the female gender than on male gender. In this sense, the longitudinal study by Pabayo and Barnett (2011) revealed that as children aged, the probability of using active transport increased, peaking at age 10, and then decreased. Likewise, our study did not show differences in active commuting regarding sex. This finding is in line with those found by Ruiz-Ariza et al. (2015), and Ruiz-Ariza et al. (2017). In the same way, the results suggest taking into account the importance of the accompaniment variable in carrying out active commuting, since it explains 30% of the total variance. In this sense, few studies have specifically assessed the accompaniment factor in their results, and those that exist do so by considering in parallel the perceived barriers and the neighborhood environment (Ayllón et al., 2019; Carver et al., 2013; Huertas-Delgado et al., 2018). In this regard, our study also highlights the importance of the environment, and the perceived physical and psychosocial barriers to active commuting. Thus, these factors together with the monitoring explained more than 54% of the total variance. A possible explanation for this issue may be due to the fact that parents who actively accompany their children have a greater negative perception of traffic and crime-related safety (Ayllón et al. 2019; Huertas-Delgado et al., 2018) Furthermore, parents take their children to school because they perceive distance as an important barrier (Carver et al., 2013). In spite of this issue, the regression analysis showed a greater probability of active commuting for those boys who went with their peers or partners. This fact could be explained through the basic psychological need for relatedness (Deci and Ryan, 2000), and the interpersonal and intrapersonal dimensions of emotional intelligence, by which physical activity is encouraged through social relationships (Vaquero-Solís et al., 2020).

In this regard, it is important to highlight that barriers and support are closely related. Thus, many parents take their children to school because they perceive distance as an important barrier (Carver et al., 2013). Similarly, our study

showed higher rates of active commuting in adolescents older than 12 years. Although age is an important factor in active travel, our results are not consistent with those found in previous studies (Mandic et al., 2015; Pabayo et al., 2011) where a younger age of the participants predicted higher rates of active commuting. A possible explanation for this issue may be due to the fact that the participants who are older have greater autonomy and their perception of barriers is lower (Herrador-Colmenero et al., 2017). Similarly, it is important to take into account the characteristics of the terrain. In this sense, Sánchez-Miguel et al. (2020), point out that the average slope as well as time and distance must be taken into account as an important factor for carrying out active commuting.

Finally, with regard to the factors that most affect active commuting. Our findings show that the most relevant factor is the distance between the home of residence and the school. These results are consistent with those shown in previous research (Carver et al., 2013; Huertas-Delgado et al., 2018; Veitch et al., 2017). Moreover, perceived barriers such as crime, the volume of traffic, and the dangerousness of the crossings are key elements that influence the realization of active commuting (Huertas-Delgado et al., 2018). Similarly, the perception of the neighborhood can be the key to active transport of children and independent mobility on the school travel (Veitch et al., 2017). For this reason, we believe that the home of residence with respect to the school is the main element for carrying out active commuting. However, the psychosocial barriers that students perceive are of great importance. In this sense, a student will be more inclined to carry out active commuting if they go with their peers and can improve their relatedness (Kamruzzaman et al., 2015).

It is important to note the findings found with caution. The present work shows some limitations, such as the cross-sectional nature of the study, which does not allow establishing cause-effect relationships. We should also highlight the non-use of any instrument that objectively evaluates the distance and time in active commuting. However, in the first place, the theoretical review conducted, which has served as a frame of reference in the development of this study, the important sample size, and finally the contribution it makes to the scientific literature in relation to the promotion of the accompaniment for active commuting.

CONCLUSION

Thus, it is concluded on the importance of distance to the school, psychosocial barriers, and accompaniment as determining elements in the performance of active commuting, showing less active commuting in those participants who went to the school with their parents. On the other hand, the age factor has been shown to be a non-determining element in carrying out active commuting for the study population. Future studies should promote active travel to school through strategies that consist of the design and establishment of safe routes carried out jointly between schoolchildren from the same school, and establish comparisons according to age ranges, taking into account the history of psychosocial benefits of the practice of physical activity. Therefore, it would be important to take into account the characteristics of the terrain such as distance,

time, slope, and signaling, among others. Regarding the implications derived from this study, its exploratory value stands out, since when carrying out future interventions that promote active commuting, it indicates which are the main elements to determine the promotion of this behavior among the most youths. In addition, the present work reveals that the behavior of active commuting to school is more common in boys and girls who go alone or accompanied with other minors than those who go with adults. In this sense, future studies should be directed to the evaluation of social skills, the promotion of autonomy and cognitive development.

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