Parental barriers to active commuting to school in children: does parental gender matter?

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A R T I C L E   I N F O

A B S T R A C T

Background: Children's active commuting to school (ACS) is influenced by parental attitudes, values and beliefs. Mothers and fathers may have different roles in family. This study compared mothers' and fathers' barriers to ACS in a sample of Spanish children.

Methods: Data from 463 families (child (age: 9 to 12 years, 50.5% boys), mother and father) were analyzed. Children completed a questionnaire about socio-demographic characteristics and the mode of commuting to school. Both parents completed a questionnaire about their perceived barriers to ACS. Distance from home to school was calculated using Google Maps. Data were analysed using multivariate binary logistic regression models with separate models for mothers and fathers.

Results: Overall, 71.7% of children used ACS. Distance, parental mode of commuting to work and perceived convenience of driving children to school emerged as significant barriers to ACS for both mothers and fathers. Child's extra-curricular activities and child's lack of interest in walking to school were also significant correlates of ACS in mothers only, but not in families that lived within a walkable distance to school.

Conclusions: Although some barriers to ACS were similar for both parents (distance, convenience of driving and parental mode of commuting to work), other barriers were specific to mothers (children's extra-curricular activities organization and lack of children's interest in walking to school). Interventions strategies for promoting ACS in children focusing on parents should be gender-specific.

1. Introduction

Active commuting has potential to increase physical activity (PA) and improve public health by preventing common non-communicable diseases in adults (Andersen, 2017) and should be politically promoted. The likely effects of policies supporting active commuting include important environmental and economical implications such as significant reductions in traffic-related air pollution, level of noise or even climate change mitigation (Nieuwenhuijsen and Khreis, 2016). Nevertheless, the main benefits of shifting from passive to active modes of transport are related to the health benefits associated with an increased PA (Rabl and de

Nazelle, 2012).

Engaging children in PA during childhood is important as physical inactivity has been associated with cardiovascular risk factors including obesity in this age group (Ekelund et al., 2012). Childhood is considered a period of life when establishment of habits and positive attitudes towards PA plays an essential role for maintaining those habits throughout life. In terms of active commuting, childhood deserves special attention as high rates of active commuting might persist into adulthood and consequently provide long-term health benefits (Beige and Axhausen, 2012).

Promoting active commuting is one of the solutions for integrating PA into children's daily life (Faulkner et al., 2009). Children who walk or cycle to school have higher daily levels of PA (Davison et al., 2008; Pabayo et al., 2012) and better cardiovascular fitness compared to children who use passive (i.e., motorized) modes of transport (Cooper et al., 2006). Active commuting to school (ACS) may also contribute to preventing overweight and obesity (Pabayo et al., 2010). However, rates of ACS in children have declined over the last decades in the most developed countries (Buliung et al., 2009; Chillon et al., 2013; Grize et al., 2010; Pavelka et al., 2017).

Based on the recently published PASTA conceptual framework of active travel behaviour (Götschi et al., 2017), individual, physical and social determinants have an important impact on individual's behaviour, including individual's preference to engage in PA (Lake and Townshend, 2013). ACS is susceptible to environmental and social influences. For example, characteristics of the school surroundings (Lovasi et al., 2011) and family influences on children's choice (Leung et al., 2016) are also influencing ACS. To reverse the declining trend of ACS in children, barriers that may prevent children from walking or cycling to school should be further examined in diverse geographical, cultural and political environments such as those that characterize European cities (Lu et al., 2014).

Given the strong influence of family on children's behaviours, ACS in children is also influenced by parental attitudes, values and beliefs (Pont et al., 2009). For instance, parental concerns for safety (Carver et al., 2010) or parental perceived convenience of driving (Trapp et al., 2011) are significant predictors of ACS in children. Furthermore, other factors related to households, such as distance from home to school (Merom et al., 2006), or parental mode of commuting to work (Henne et al., 2014) also significantly influence how children commute to school. Therefore, family factors and parental support represent important social environmental factors that influence children's mode of transport to school (Mah et al., 2017).

Most previous studies that examined parental barriers to ACS in children did not differentiate the findings based on whether the questionnaire was completed by a mother or a father (Lu et al., 2014; Pont et al., 2009). However, empirical findings show that mothers and fathers play different roles in a family life. For instance, compared to fathers, mothers are more engaged in child care (Chesley & Flood, 2017). With respect to PA, previous findings have shown that father and mother may influence their child's PA by different processes (Bois et al., 2005; Edwarson & Gorely, 2010). Mothers seems to offer more logistic support to their children whereas fathers are more prone to provide higher levels of explicit modelling, intentionally using their behaviour to encourage their child to be physically active (Davison et al., 2003). Moreover, cultural values and social norms may also support and promote gender-specific behaviours (Deaner, Balish and Lombardo, 2016) and therefore influence mothers' and fathers' perceptions of and hence barriers to different modes of transport to school. Hence, it could be hypothesized that mothers and fathers have different perceptions of barriers to ACS and therefore may have different influence on the actual commuting to school behaviours in children.

The primary objective of this study was to compare mothers' and fathers' perceived barriers to ACS in a sample of Spanish children. The secondary objective was to determine correlates of ACS from mothers' and fathers' perspective. The third objective was to compare acceptable distances for children's walking and cycling to school from mothers' and fathers' perspectives. To the best of our knowledge, this is the first study in which attention has turned to study mothers' and fathers' perspective on ACS in children. Understanding potential differences in mothers' and fathers' barriers to ACS in children will provide valuable knowledge for designing future ACS interventions which could successfully address gender-specific parental barriers.

2. Methods

2.1. Study design

Data were collected as part of the CAPAS-City project (Centre for the Promotion of PA and Health) in Huesca (Spain) in 2017. One of the main aims of this cross-cultural project between Spain and France deals with the analysis of children's ACS patterns and the implementation of context-based strategies to promote ACS. Huesca is a mid-sized Spanish city placed in the north-east of Spain with a population of 52,399 inhabitants who live in an urban area of 6.75 km^2 (4.21 km^2 when excluding an industrial area) with 7762.8 inhabitants/km^2. The research project was approved by the Ethics Committee on Clinical Research of Aragon.

2.2. Participants

All 12 primary schools in Huesca were invited to participate in this study through a personal meeting of researchers with the headmaster of each school. Participating schools were asked to allow researchers to invite children from grades 4 to 6 (age: 9 to 12 years) and their parents to participate in this study. One school declined to participate. Thus, the final sample included 11 schools (92% school participation rate; 7 state and 4 state-integrated schools), with a total population of 1,560 potential children participants.

Researchers sent a letter to all potential children participants and their fathers and mothers to inform them about the project and to invite them to participate in this study. Parents were given 3 to 4 days to consider the invitation and sign parental consent. Overall, 1,263 parents signed consent (80.96% participation rate). Children also signed their own consent before completing the

questionnaire at school (100% participation rate). A total of 978 questionnaires from mothers and 833 questionnaires from fathers were received (77.43% and 65.95% completion rates, respectively). After excluding incomplete or invalid children's and parental questionnaires, and selecting only families in which all participants (i.e., child, father and mother) completed the study questionnaire, a sample of 649 families remained. In the next step, we excluded 59 families with divorced/separated parents who lived in different households and 127 households located > 3.5km from child's school (i.e. households located outside the urban area of Huesca). Therefore, data from 463 families with complete and valid child's, mother's and father's questionnaires were included in the analysis.

2.3. Procedure

Data were collected from February to May 2017. Research team distributed children's questionnaires. Children filled out the questionnaire at school during one class period supervised by the class' mentor teacher. Parental questionnaires for mothers and fathers who had signed consent were given to children at school to take home along with an explanatory letter. Fathers and mothers were asked to return completed questionnaires through standardized lines of communication at each school (e.g., direct return to mentor teacher, attached to homework, etc.) within ten days.

2.4. Outcome measures

2.4.1. Sociodemographic characteristics

Children self-reported their age and gender. Fathers and mothers self-reported their own age, education level (none, primary school, secondary school, professional training or university) and employment status (employed or unemployed). Socioeconomic status was calculated using the Family Affluence Scale II (FAS II, Currie et al., 2008) from the completed parental questionnaires. FAS II is a four-item scale which allows to calculate a composite score ranging from 0 to 9 which was used in analyses. There were no significant differences in the sociodemographic characteristics between participants and families excluded from the analysis (e.g., excluded participants: children's gender, 48.5% females; children's age, 10.62 ± 0.97 years; mothers' age, 42.43 ± 5.13; fathers' age, 45.61 ± 5.41; mothers' employed, 84.2%; fathers' employed, 96.8%).

2.4.2. Commuting to and from school

Children self-reported their mode of commuting to and from school for every weekday using the Mode and Frequency of Commuting To and From School Questionnaire (Chillón et al., 2017). Mode of commuting to school was assessed using questions "How do you travel to/from school on… (day of the week)?" with the response categories "car", "public bus", "motorbike", "school bus", "bicycle", "on foot" and "other". Each journey to school (i.e., to and from school) for every day was categorized into (1) active (on foot or by bicycle), or (0) passive (by car, public bus, school bus, motorcycle). After that, all weekly active trips were summed into a single variable ranging from 0 to 10. Finally, a dichotomous variable 'active commuters' (≥6 active trips per week) versus 'passive commuters' to school (< 6 active trips per week) was calculated (Petrunoff et al., 2013).

Parents self-reported their own modes of commuting to work by responding to a question "How do you usually travel to work?" with response categories being "car", "public bus", "motorbike", "bicycle", "on foot" and "other". Parents who walked or cycled to work were categorized as 'active commuters' whereas those using a car, public bus or motorbike were categorized as 'passive commuters'.

2.4.2.1. Distance from home to school.
Household address was independently provided by children, fathers and mothers to avoid spelling mistakes occasionally made by younger children. In case of spelling differences, the researchers checked the home address in all three surveys and the street map of the city to confirm the correct address. Google Maps software was used to calculate distance from home to school for each family, selecting the shortest route on foot via the street network between each household and the main school entrance.

2.4.2.2. Parental perceived barriers to ACS.
Parental perceived barriers to ACS were assessed using a 23-item questionnaire (Chaufan et al., 2012), developed from a previous parental barriers questionnaire (McDonald et al., 2011) and adapted to the Spanish cultural context (Huertas-Delgado et al., 2017). Assessed barriers included perceived distance to school, traffic, pedestrian and cycling infrastructure, personal and traffic safety, convenience, companionship, logistic requirements, child's interest in walking/cycling and the weather. All items were assessed using a 4-point Likert scale ranging from (1) strongly disagree to (4) strongly agree. To calculate the proportion of parents agreeing with each statement, 4-point Likert scale items were also recoded into 'disagree' (1 and 2) and 'agree' (3 and 4).

2.5. Statistical analysis

Sociodemographic characteristics of children and parents were analyzed using descriptive statistics. Differences between mothers' and fathers' sociodemographic characteristics and perceived barriers to ACS were tested using independent samples t-test for continuous variables and Chi-square tests for categorical variables. The threshold distance for active commuting was calculated using the receiver operating characteristic (ROC) curve analysis based on the mode of commuting to school ('active' versus 'passive') and the distance from home to school. Considering sensitivity and specificity data of the test, the Younden Index was calculated (Schisterman et al., 2005) to obtain the threshold distance that best discriminates 'active commuters' from 'passive commuters'. The larger the area

Table 1
Socio-demographic characteristics of children and parents.

Variables	Children (n = 463)		
Age (years) (mean ± SD)	10.6 ± .9		
Distance to school (meters) (mean ± SD)	750.4 ± 529.3		
Gender[n(%)]			
Male	234 (50.5%)		
Female	229 (49.5%)		
Type of school [n(%)]			
State school	256 (55.3%)		
State-integrated school	207 (44.7%)		
Mode of commuting [n(%)]			
Active	332 (71.7%)		
Passive	131 (28.3%)		
	Mother (n = 463)	**Father (n = 463)**	**p-value**
Age (years) (mean ± SD)	43.16 ± 4.69	45.59 ± 5.23	.044
Education[n(%)]			
None	5 (1.1%)	10 (2.2%)	
Primary school	56 (12.1%)	91 (19.7%)	
Secondary school	63 (13.6%)	78 (16.8%)	
Professional training	59 (12.7%)	100 (21.6%)	
University	280 (60.5%)	184 (39.7%)	< .001
Employed [n(%)]	388 (83.8%)	444 (95.9%)	.121
Mode of commuting to work [n(%)]			
Active	235(50.8)	187(40.4)	
Passive	228(49.2)	276(59.6)	< .001

under the ROC curve (ranking from 0 to 1), the more discriminatory is the test. The area under the curve values of .90 are considered excellent, .80–.89 good, .70–.79 fair, and less than .70 poor (Metz, 1978).

Binary logistic regression analysis was used to determine multivariate correlates of children's ACS from mother's and father's perspective separately. First, bivariate associations were examined between the mode of children' commuting to school (as a dependant variable) and each of the independent variables (child's age and gender, distance from home to school, type of school, socioeconomic status, mother's/father's mode of commuting to work, mother's/father's level of education, mother's/father's age, number of working parents in a family and mother's/father's perceived barriers to ACS (using 4-point Likert scale data)). All significant univariate correlates (p < .05) were included into a multivariate binary logistic regression model. Separate models were created for mothers and fathers including the total sample as well as parents living in households within the threshold ACS distance to school determined using the ROC analysis. All statistical analyses were conducted using the SPSS Software Version 21.0 for Windows. The level of significance was set at p < .05.

3. Results

Sociodemographic characteristics are presented in Table 1. Overall, 71.7% of children actively commuted to school including 46.6% boys and 65.7% of children enrolled in state schools. In the total sample, 375 (81.3%) households had two employed parents. Compared to fathers, mothers were on average 2 years younger, had higher education and had higher rates of active commuting to work (Table 1). Families with both parents employed also showed higher rates of active commuting to work in mothers (50.6%) compared to fathers (40.9%).

Perceived barriers for fathers and mothers are displayed in Table 2. The most common barrier to ACS reported by over two thirds mothers and fathers was concern about the weight of the school bag. Over half of parents reported the lack of sidewalks or their poor conditions, the lack of policemen at the road crossings, traffic volume, traffic speed and the lack of other children or adults cycling to school as a barrier to ACS for their child. Compared to fathers, mothers reported significantly higher rate of concern regarding the lack of a policeman at the road crossings as a barrier to ACS in children. No other statistically significant differences between fathers' and mothers' perceived barriers to ACS were observed.

The results of the binary logistic regression analysis conducted for mothers and fathers separately showed that for both parents a positive correlate of child's ACS was active commuting of parents to their work whereas negative correlates were distance from home to school and parental perception of convenience of driving rather than walking their child to school (Table 3). In addition, for mothers only, mothers' perceptions of child's extra-curricular activities organization before or after school were positively related to child's ACS whereas mothers' perception that it is boring for their child to walk to school was a negative correlate of ACS in children. Mothers' and fathers' models explained approximately half of the variance in children's ACT ($R^2 = .52$ and $R^2 = .49$, respectively).

To account for the effect of distance on ACS behaviours, ROC curve analysis was conducted to determine the threshold distance for ACS in the study sample. The threshold ACS distance to school was 775 m (area under the curve: .855; p < .001). Overall, 293 children (63.3%) lived within this threshold ACS distance to school (51% boys, 89% active commuters, 72.4% students from state schools). When binary logistic regression analysis was repeated in this subsample, only distance from home to school and parental perceptions of convenience to drive their child to school remained statistically significant as negative correlates of ACS in children

Table 2

Parental perceived barriers to active commuting to school.

Barriers	Mothers		Fathers		p-value
	Average (mean ± SD)	Agree [n(%)]	Average (mean ± SD)	Agree [n(%)]	
Perceived distance					
There is a long distance from home to school	1.9 ± 1.2	137 (29.6)	1.9 ± 1.2	132(28.7)	.384
It takes a long time to go from home to school	1.7 ± 1.1	112 (24.2)	1.7 ± 1.1	110 (23.8)	.539
Traffic					
There is heavy traffic in the route to school	2.6 ± 1.1	150 (54)	2.5 ± 1.1	233(50.3)	.645
Car's speed is too high in the route to school	2.5 ± 1.1	232 (50.1)	2.4 ± 1.1	134 (48.2)	.693
Pedestrian and cycling infrastructure					
There are no sidewalks or they are in poor conditions	1.6 ± 1.0	80 (17.3)	1.7 ± 1.0	97 (21)	.079
There are no bicycle lanes or they are in poor conditions	2.8 ± 1.3	287 (62)	2.8 ± 1.3	283 (41.1)	.701
There is no place to leave the bicycle	2.3 ± 1.2	205 (44.3)	2.4 ± 1.3	212 (45.8)	.753
Safety					
Lack of safety in intersections and crossings	2.8 ± 1.1	188 (62.2)	2.6 ± 1.1	260 (56.2)	.749
There are no policemen at the road crossings	2.8 ± 1.1	204(65.7)	2.6 ± 1.2	259(55.9)	.009
There is violence or crime in the area	1.4 ± 0.8	48 (10.4)	1.4 ± 0.9	52 (11.2)	.341
Convenience					
My child has activities before and/or after school which difficulty ACS.	2.1 ± 1.1	179 (38.7)	2.2 ± 1.1	183 (39.5)	.949
It is more convenient to drive than to accompany him/her on foot	1.6 ± 1.0	88 (19)	1.6 ± 1.0	95 (18.4)	.944
It is more convenient to drive than to accompany him/her by bicycle	1.9 ± 1.2	149 (32.2)	1.9 ± 1.2	140 (30.2)	.304
Companionship					
There are no adults who can walk my child to school on foot	1.7 ± 1.1	109 (23.5)	1.8 ± 1.1	119 (25.7)	.672
There are no other kids with whom my child can go on foot.	2.1 ± 1.2	161 (34.8)	2.1 ± 1.2	156 (33.7)	.990
There are no other parents who bring their children on foot.	1.7 ± 1.1	105 (22.7)	1.7 ± 1.0	104 (22.5)	.437
There are no adults who can walk my child to school by bicycle	2.5 ± 1.3	229 (49.5)	2.4 ± 1.3	224 (48.4)	.088
There are no other kids with whom my child can go by bicycle.	2.7 ± 1.2	269 (58.1)	2.7 ± 1.2	269 (58.1)	.761
There are no other parents who bring their children by bicycle	2.5 ± 1.2	246 (53.1)	2.5 ± 1.2	246 (53.1)	.268
Logistic requirements					
My child carry a lot of weight into his/her school bag.	3.00 ± 1.1	225 (70.2)	2.9 ± 1.1	318 (68.7)	.780
Child's interestin walking/cycling					
It is boring for my child to go on foot.	1.3 ± 0.7	32 (6.9)	1.3 ± 0.7	38 (8.2)	.102
It is boring for my child to go by bicycle.	1.5 ± 0.9	55 (11.9)	1.4 ± 0.8	55 (11.9)	.199
Weather					
Bad weather (cold, rain, heat…)	1.8 ± 1.0	123 (26.6)	1.9 ± 0.9	123(26.6)	.367

whereas parental active commuting to work remained as a statistically significant positive correlate in both mothers' (OR (odds ratio): 10.03) and fathers' (OR: 3.26) models (Table 4).

4. Discussion

This study compared mothers' and fathers' barriers to ACS in a sample of Spanish children. Main findings showed that: (a) although some barriers to children's ACS were similar for both parents (distance from home to school, perception of convenience of driving children to school and parental mode of commuting to work), other perceived barriers were specific for mothers (perceptions of child's extra-curricular activities organization and the children's lack of interest in walking to school) in the total study sample; (b) when the barriers to ACS were analysed in families living within the walking distance to school (775 m in this sample), distance from home to school and perception of convenience of driving emerged as significant negative correlates whereas parental active mode of commuting to work positively correlated with children's ACS from both mothers' and fathers' perspective and gender differences in parental barriers to ACS were not present.

In the multivariate analysis, significant correlates of ACS for both mothers and fathers in this study included distance to school, mode of parental commute to work and parental perceptions of the convenience of driving their child to school. Distance from home to school is the strongest predictor of ACS in children and has been reported as one of the most frequent and influential environmental barriers to ACS in children in multiple countries (Lu et al., 2014; Rodriguez and Vogt, 2009; Timperio et al., 2006). The threshold walking distance for this sample is quite similar to another recent Spanish study (875 m in Rodriguez-López et al., 2017) but lower than in other international studies (Chillón et al., 2015; Larsen et al., 2009). Given that the shorter the distance between home to school is associated with the higher likelihood of ACS in children (Galvez et al., 2010; Napier et al., 2011), our findings seems to be consistent with those studies and other recent studies conducted in other cities in Spain where greater distances were associated with lower rates of ACS (Huertas-Delgado et al., 2017; Villa-González et al., 2012). Hence, distance from home to school, and consequently school location, should be considered as a key point in terms of policy implications (Tester, 2009; Voorhees et al., 2010). It should be noted that Spanish national education policy allows parents to choose any school in their city, with no obligation to enrol their child

Table 3

Correlates of active commuting to school in children from mothers' and fathers' perspectivesin the total sample (n = 463).

Variable	Mother				Father			
	B	SE	p-value	Exp (B)	B	SE	p-value	Exp (B)
Child's age	.14	.26	.583	1.154	.229	.226	.310	1.258
Sex (Ref.: girls)	−.63	.44	.157	.534	−.588	.377	.119	.555
Distancefromhome to school	**−.00**	**.00**	**.000**	**.996**	**−.003**	**.001**	**.000**	**.997**
Type of school (Ref.: state school)	−.13	.54	.803	.874	−.062	.425	.884	.940
Mother's/Father's age	.01	.05	.789	1.014	.084	.041	.041	1.087
Mother's/Father's mode of commuting to work (Ref.: Passivecommuter)	**1.76**	**.48**	**.000**	**5.828**	**1.683**	**.439**	**.000**	**5.383**
There is a long distance from home to school	.22	.33	.507	1.242	.193	.307	.529	1.213
There is heavy traffic in the route to school	.17	.30	.581	1.181	.107	.255	.675	1.113
My child has activities before and/or after school which makes ACS difficult.	**.49**	**.23**	**.033**	**1.635**	−.015	.180	.935	.985
Car's speed is too high in the route to school	−.27	.33	.421	.765	.028	.272	.919	1.028
It takes a long time to go from home to school	.32	.38	.401	1.379	.033	.321	.918	1.034
Lack of safety in intersections and crossings	−.17	.29	.559	.844	−.212	.221	.338	.809
There are no policemen at the road crossings	.01	.27	.960	1.014				
Bad weather (cold, rain, heat…)	−.49	.26	.053	.610	−.095	.227	.675	.909
My child carry a lot of weight into his/her school bag.	−.05	.22	.811	.949	−.268	.187	.152	.765
It is more convenient to drive than to accompany him/her on foot	**−1.31**	**.27**	**.000**	**.271**	**−.859**	**.244**	**.000**	**.424**
There are no adults who can walk my child to school on foot	.11	.22	.610	.895	−.099	.187	.598	.906
There are no other kids with whom my child can go on foot.	−.32	.23	.168	.727	.053	,208	.799	1.054
It is boring for my child to go on foot.	**−.58**	**.34**	**.050**	**.560**	−.195	.280	.486	.823
There are no other parents who bring their children on foot	.50	.26	.054	1.647	.141	.229	.539	1.152
It is more convenient to drive than to accompany him/her by bicycle	−.06	.23	.792	.940	−.078	.198	.693	.925
There are no adults who can walk my child to school by bicycle	−.29	.20	.148	.746	−.315	.181	.082	.729
There are no other kids with whom my child can go by bicycle.	.15	.22	.490	1.164	.090	.196	.647	1.094
There are no other parents who bring their children by bicycle	.11	.22	.621	1.113	.096	.191	.616	1.101

Note: Only significant bivariate correlates were included into the analysis. Although children's age and sex were not statistically significant, they were included in the multivariate models. Percentages of explained variance: $R^2 = .52$ in mother's model. $R^2 = .49$ in father's model.

Table 4

Correlates of active commuting to school in children based on mothers' and fathers' perspective in families living within the threshold active commuting distance to school (n = 293).

Variable	Mother				Father			
	B	SE	p-value	Exp (B)	B	SE	p-value	Exp (B)
Child's age	.098	.319	.760	1.102	.41	.263	.119	1.506
Sex (Ref.: girls)	−.374	.583	.522	.688	−0.285	.464	.539	.752
Distance from home to school	**−.005**	**.002**	**.009**	**.995**	**−.003**	**.001**	**.016**	**.997**
Mother's/Father's mode of commuting to work (Ref.: Passive commuter)	**2.306**	**.68**	**.001**	**10.03**	**1.182**	**.524**	**.024**	**3.262**
Car's speed is too high in the route to school	−.396	.301	.189	.673				
Lack of safety in intersections and crossings	−.031	.317	.923	.97				
Bad weather (cold, rain, heat…)	−.044	.329	.894	.957				
His/her child carry a lot of weight into his/her school bag.	−.487	.353	.168	.614				
It is more convenient to drive than to accompany him/her on foot	**−1.269**	**.362**	**.000**	**.281**	**−1.006**	**.343**	**.003**	**.366**
There are no adults who can walk my child to school on foot	.057	.309	.854	1.059	−.038	.252	.88	.963
There are no other kids with whom my child can go on foot.	−.083	.257	.746	.92				
It is boring for my child to go on foot.	−.502	.462	.277	.605				
It is more convenient to drive than to accompany him/her by bicycle	.005	.286	.986	1.005	.214	.269	.426	1.239
There are no adults who can walk my child to school by bicycle	−.377	.268	.159	.686	−.33	.203	.104	.719
There is no place to leave the bicycle	−.222	.25	.375	.801				

Note: Only significant bivariate correlates were included into the analysis. Although children's age and sex were not statistically significant, they were included in the multivariate models. Percentages of explained variance: $R^2 = .29$ in mother's model. $R^2 = .14$ in father's model.

into the closest school. As reported in previous studies, the presence of school choice has significant implications not only for ACS (Mandic et al., 2017b), but also for education, health and sustainability (Mandic et al., 2017c). Feasibility of ACS should be considered as one of the main arguments for school location decisions (Tester, 2009). Education policies should also consider the wide range of both positive and negative implications of school choice that extend beyond education (Mandic et al., 2017c).

In the present study children's ACS was significantly associated with mothers' and fathers' mode of commuting to work, which seems to be consistent with previous studies (Henne et al., 2014). To our knowledge there are only a few studies which have analyzed associations between parental and children's daily modes of commuting (Henne et al., 2014; Susilo and Liu, 2015). The findings from the current study are not surprising considering the demanding scheduling commitments of modern families. Parental modelling of active travel has been positively associated with ACS in adolescents (Carlson et al., 2014) and children's active travel mode on a daily

basis (Susilo and Liu, 2015). ACS could be understood as a type of logistic support provided by parents, which, in turn, has been positively associated with higher levels of PA in children (Jago et al., 2011). In the present study children living within the walking distance to school and whose mothers used an active mode of commuting to work had 10 times higher odds to ACS. Other studies have shown that mothers usually offer high levels of logistic support, often higher than fathers (Davison et al., 2003). Therefore, it is possible that this study found 10 times higher odds to ACS because in Spain it is mothers who in most cases accompany their children on the way to school. However, these findings need to be interpreted with caution given the small size of the city where this study was conducted and further research is needed.

Parental perception of driving being more convenient than walking their children to school emerged as a significant perceived barrier to ACS from both mothers' and fathers' perspective and was associated with a lower likelihood of children's ACS in this study. Previous studies have also reported convenience of driving children to school as a major parental barrier to children's ACS in general (Faulkner et al., 2010; MacDonald & Aalborg, 2009) as well as specifically for walking (Panter et al., 2010) and cycling to school (Trapp et al., 2011). A recent study also reported that more than half of adolescents reported convenience of being driven to school as a barrier to ACS (Mandic et al. 2017a). Therefore, parental perceptions of convenience of driving their children to school may also influence children's preferences for different modes of transport later in life. One review stated that convenience of car travel may be related to cultural influences as well as structural factors (Lorenc et al., 2008). For instance, the need of busy-time families to fulfil demanding scheduling commitments in children's afternoon may be one reason for the convenience of car use (Trapp et al., 2011). However, in our study, mothers' perception of extra-curricular activities organization showed an unexpected positive association with ACS in children. The small size of the city and the recent pedestrianisation process that occurred in the last few years in the city centre (0.32 km^2 pedestrianised; 7.6% of urbanised area) could explain this result (Mäki-Opas et al., 2016). Pedestrian areas may improve accessibility to facilities, making easier for mothers to fulfil children's commitments on foot rather than using a private car. Nevertheless, a multitude of factors related to family structure, decision-making and lifestyle choices could influence parental perception of convenience (Trapp et al., 2011). Therefore, parental perception of the convenience of driving children to school is a complex concept that should be further studied from a qualitative perspective to create better understanding of the underlying characteristics and to design future interventions to minimize the convenience of driving as one of the parental barriers to children's ACS.

In the present study, organization related to children's extra-curricular activities before and after school was a positive correlate of ACS from mothers' perspective. This finding needs to be further examined taking into consideration gender differences in child care responsibilities (Roeters and Gracia, 2016). Previous studies have shown that, compared to fathers, mothers were disproportionally more engaged in routine child care (Chesley & Flood, 2017, Offer, 2014), using the car to manage complex daily routines and to implement notions of what constitutes being a good mother (Dowling, 2000). Our findings seem to indicate that mothers also play a key role in children's commuting to school behaviours, which could contribute to further understanding of the subtle dimensions of the unequal division of childcare by gender (Offer, 2014). However, it is important to note that significant correlates of children's ACS from mothers' and fathers' were similar for both parents and did not include extra-curricular activities when analysed in the sample of families that lived within a walkable distance to school. Therefore, interventions programs to promote ACS should consider the key role of mothers and be based on family-friendly strategies that address promotion of ACS from a gender equality perspective, especially when designing interventions for children living further away from school (Roeters and Gracia, 2016). For instance, following a participatory approach, parental child care workshops could be organised to discuss about how parents could manage their child care time to promote ACS as much as possible.

The major strength of this study is the high school participation rate in one city (11 out of 12 schools; 92%) and the approach followed to analyze the associations of parental barriers on ACS in children considering mothers' and fathers' perspectives independently. Nevertheless, this study has several limitations including common limitations related to self-reported data and limited reliability of items used to assess mothers' and fathers' perceived barriers to ACS (MacDonald et al., 2011). In addition, our sample included only families with both parents living in the same household. Therefore, our findings may not be generalizable to other family contexts (with divorced, separated, or single parents) that are becoming more common nowadays. Moreover, we cannot exclude a possibility that mother and father completed the questionnaire together which could influence the reported results. Finally, these findings may not be generalizable to other urban or rural areas of Spain or internationally. Therefore, further research in different urban, rural and cultural contexts is warranted.

5. Conclusions

This study contributes to a deeper understanding of the specific correlates of mothers' and fathers' perspectives on ACS in children. The present study reveals that from both mothers' and fathers' perspective the negative correlates of children's ACS were distance from home to school and parental perception of the convenience of driving their child to school whereas a positive correlate was parental active commuting to work behaviours. In addition, mothers-specific correlates of ACS included a positive association with children's extra-curricular activities organization and a negative association with the lack of child's interest in walking to school. However, gender differences in parental perceptions were not present among families living within a walking distance to school. These findings reinforce the idea that the design of future interventions for promoting ACS in children should consider the mother- and father-specific barriers to ACS and be based on family-friendly strategies which respect a gender equality perspective. Addressing built and social environmental factors that affects both mothers' and fathers' perspective might directly contribute to increase rates of ACT in children. Finally, due to the fact that parents' cognitive, behavioural and affective responses to children's behaviour seem to be cross-culturally different (Bornstein et al., 2011), further research is warranted in order to investigate whether mothers' and fathers'