

Active Transportation: The Role of Parent Attitude, The Physical Environment, and Social Capital

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Background: Despite recommendation and confirmed physical activity benefits, participation in active transportation to school (ATS) has continued to decline. This study's purpose was to create and test a model of ATS that is directly explained by the constructs of parent attitude, the physical environment, and social capital controlling for age and gender. **Methods:** Participants were parents ($N = 248$) of children at 6 elementary and 2 middle schools in 1 district in the Southwestern United States. The survey included previously validated behavior, environmental, attitude, and social items (eg, Safe Routes to School Parent Survey/U.S. General Social Survey). Structural equation modeling was used to test the fit of the model and whether parent attitude, the physical environment, and social capital were associated with active transportation. **Results:** An adjusted measurement model was a good fit for the data. The physical environment ($\beta = 0.391$; $P < .01$) as well as parent attitude ($\beta = 0.535$; $P < .001$) were positively associated with ATS. **Conclusion:** This study supports a model of ATS, affirming that parent attitude, the physical environment, and social capital are effective constructs from which to conceptualize associations with walking and biking to school.

Keywords: active transport, built environment, social capital

Despite the known health benefits associated with active transportation to school (ATS),¹⁻⁵ rates have declined in the United States. In 1969, approximately 48% of all school children walked or biked to or from school. By 2014, overall rates dropped between 15.2% (to school) and 18.4% (from school),⁶ with some areas reporting as few as 5% of children walking to school,⁷ resulting in a national movement to increase levels of ATS.^{8,9} Physical activity (PA) behavior, such as ATS, is influenced by a complex interaction of factors at a variety of levels including intrapersonal, social, and physical.^{10,11} Individual attitudes (ATT) of the parent and/or child are often included as a central influence on ATS behavior,¹² as several studies have provided evidence that parental ATT or perceptions are more strongly associated with travel behaviors than elements of the physical environment (PE).¹³⁻¹⁶ Although this single factor has merit, there is a need to better understand how the shared beliefs of parents and/or children within the community might also influence behavior. Social capital (SC) has the unique potential to reveal elements within the social environment that may impact ATS as it refers to the capacity of supportive social networks to facilitate action.¹⁷ Although SC exists in the relationships between individuals, its power lies in the ability of those individuals to promote collective behavior—conceivably walking and biking to school. The purpose of this research is to develop a test a model that simultaneously examines the relationship between parental ATT, the PE, and SC on ATS.

Attitudes

A number of studies have examined attitudinal perceptions and their association with ATS. Merom et al¹⁸ found a positive association between students who used frequent modes of ATS and parents who believed that walking was beneficial to health.

Ease of travel also contributes to decisions regarding mode of transportation to school. For example, lack of time and work schedules have been cited as reasons to not support ATS.^{19,20} In fact, in their study of 37 parents, Faulkner et al²¹ found that every individual based their decision on how to send their child to school on efficiency. Positive parental ATT²² and peer and family support²³ are positively associated with children's ATS. Walking and biking have been found to enhance self-esteem and responsibility in children,^{24,25} which could lead to parents entrusting their children to walk or bike.

Physical Environment

Distance from school has been reported as a key barrier, while shorter distances have been reported as facilitators of ATS.^{20,21,26-31} In fact, children who live within 0.5 to 1 mile of their school may be 3 to 10 times more likely to use ATS.^{16,30} In addition, children who have to cross a major road may be twice as likely to have a negative association with ATS.^{30,32} Issues regarding traffic are common barriers to walking and biking to school^{14,20,33} and include negative parental perceptions of road safety,^{16,34-36} traffic speeds,^{19,27} and the volume of traffic.³⁷ Improvement of the design and condition of sidewalks^{38,39} and the presence of crossing guards^{20,40-42} have also been reported as positively correlates of ATS. These elements may generate feelings of safety,^{43,44} which can enhance the likelihood of using active modes of transport.

Social Capital

Putnam's⁴⁵ leading view of SC "refers to connections among individuals . . . and the norms of reciprocity and trustworthiness that arise from them" (p. 19). He stresses that the collective value of these social networks and the inclinations that arise from them result in reciprocal action. A growing body of research suggests that social networks rich in trust and norms help individuals achieve health-enhancing objectives,⁴⁶⁻⁴⁸ such as walking and biking to school. Although a number of studies have investigated

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social support as an indicator of PA in adults,^{49,50} less research has examined the impact of SC on PA, and specifically ATS among youth. Some studies have found that the degree of social cohesion and social control in the neighborhood may positively influence ATS^{51,52} because parents feel that others in the neighborhood are looking out for the welfare of their children. These elements of SC may be particularly important in overcoming barriers related to parental safety concerns.^{10,19,30,35} Timperio et al³⁰ found that children were more likely to walk or bike to school when parents perceived that other children in the area used ATS. Furthermore, knowing and trusting neighbors are associated with walking to school⁵³ and have been shown lead to an increase in ATS over time.⁵⁴ Some research has examined SC as an outcome related to ATS. For example, Eyler et al¹⁹ found that parents who supported ATS recognized the benefit to a community, such as connecting people together, promoting communication, or facilitating community improvements when kids are walking to school. Similarly, Stewart⁵⁵ suggested that walking to school with neighbor children promoted a sense of community and trust among families. Walking for exercise among children has also been shown to be associated with knowing neighbors.⁵⁶

Social–Ecological Framework

The social–ecological perspective provides a dynamic insight into the connection between individuals, their social interactions, and environments.^{57–59} Several researchers have developed models to explain the factors that influence ATS behavior (eg, McMillan,⁶⁰ Mitra,¹² Panter et al,⁶¹ Pont et al,⁶² Sirard and Slater⁶³), supporting the complexity of ATS behavior. For example, given particular elements of the PE, a parent can form an opinion about the safety of different modes of travel for their child's trip to school.⁶⁰ The proposed model (Figure 1), constructed on the principles of social–ecological theory, aims to further existing research by including the element of SC to investigate how health behavior at the individual level interacts with the physical and sociocultural environment.⁶⁴ The following hypotheses were tested:

H₁: Positive perceptions of the PE are associated with higher rates of ATS.

H₂: Positive parent ATT toward ATS are associated with higher rates of ATS.

H₃: Higher levels of SC are associated with higher rates of ATS.

Method

Research Design

Questionnaires were administered to the parents/guardians of students in grades 3 to 8 in a suburban public school district in the Southwestern United States to gather information about elements that impact travel behaviors of students. Institutional approval of the protocol was obtained from Arizona State University and the school district; parents provided informed consent and students provided assent.

Participants

Of the total sample (N = 248), the majority (87%) of the data was from the elementary schools (grades 3–5). Parents of more females (61.0%) than males (37.5%) participated in the survey. The most common mode of transportation to school was by car (42.2%) with 25.5% reporting walking or biking. The school district was in its third year of receiving Safe Routes to School funding and had implemented educational (annual bike rodeos and police officer visits) and enforcement (crossing guard training and equipment) strategies at each of its 8 elementary and middle schools to promote ATS.

Variables

Although ATS was measured directly, ATT, PE, and SC were latent constructs comprised of several observed indicator variables. The questionnaire (see [Supplementary Material](#) [available online])

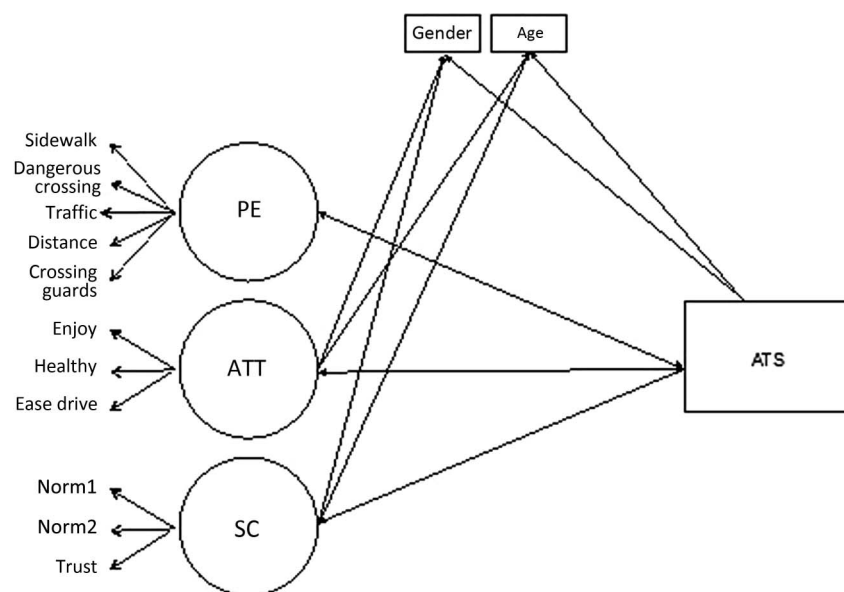


Figure 1 — Conceptual model of association between PE, ATT, SC, and ATS. Note: Latent variables—PE, ATT, and SC are represented by ovals and comprised of several indicator variables. Arrows from left to right indicate hypothesized direction of influences. Table 1 displays information related to indicator variables and covariates. ATS indicates active transportation to school; ATT, attitudes; PE, physical environment; SC, social capital.

contained questions about travel behaviors and ATT/PE (adapted from the Safe Routes to School Parent Survey about walking and biking to school), and SC (adapted from the US General Social Survey).⁶⁵ Items asking about travel behaviors were found to have moderate to high test–retest reliability (κ range: .62–.97). Items asking about ATT/PE were found to have lower test–retest reliability (κ range: .31–.76).⁶⁶ Items asking about SC had an acceptable mean reliability of the scores (.71).⁶⁷

ATS Behavior. Parents were asked to circle the number of days their child used the following methods to get to/from school: walk, bike, bus, car, or other vehicle. Walking and biking were combined to form overall ATS. The total number of days spent actively transporting to and from school was calculated for each student with possible scores ranging from 0 to 10.

Attitudes. The latent construct of ATT contained 3 measured indicator variables. Parents reported their level of agreement on a 7-point scale (1 = strongly disagree and 7 = strongly agree) with questions about health benefits, ease of travel, and child enjoyment related to walking and biking to school.

Physical Environment. The latent construct of the PE contained 5 measured indicator variables. Parents were asked to rate their level of agreement on a 7-point scale (1 = strongly disagree and 7 = strongly agree) with whether “it is difficult for my child to walk or bike to school (alone or with someone else) because . . .” of concerns with sidewalks, dangerous crossings, traffic, distance, and lack of crossing guards. Specific question wording can be found in the questionnaire included in the [Supplementary Material](#) (available online).

Social Capital. The latent construct of SC contained 3 measured indicator variables. Parents were asked to their level of agreement on a 7-point scale (1 = strongly disagree and 7 = strongly agree) with whether other children walked/biked to school alone, other children walked/biked with an adult, and whether neighbors could be trusted.

Demographics. Age and gender of the child were included as covariates.

Data Analysis

Data were first analyzed to outline descriptive information about participants, school sites, and travel patterns. Next, all scale items measuring PE, ATT, and SC were reverse coded (where needed) to ensure that all results were measured in the intended direction. Table 1 displays the correlations between individual scale item measures for each construct, scale reliability indices, and descriptive information. Construct validity and reliability were supported as all construct indicators showed reasonable quality (standardized loadings exceeding 0.6), indicating that an acceptable amount of variance was captured by the latent constructs.⁶⁸ Model estimated scale reliability calculations using Raykov’s⁶⁹ composite reliability measure indicated that all latent constructs were of acceptable levels (above 0.6).^{70–72}

Structured equation modeling using Mplus⁷³ (Muthén & Muthén, Los Angeles, CA) was used to test the fit of the model and whether the PE (H_1), ATT (H_2), and SC (H_3) were associated with ATS (Figure 1). First, a measurement (or hypothesized) model consisting of all relationships between factors and variables was analyzed for data-model fit using a latent variable path analysis. Next, a structural model (Figure 1), in which ATS was regressed on PE, ATT, and SC and the control variables of age and gender were regressed on each variable, was tested. All structural paths and variances of all exogenous latent factors were automatically fixed at 1 by Mplus.⁶⁸

Following Byrne’s⁷⁴ guidelines, the adequacy of the fit between the specified model and the observed data (ie, model fit) was evaluated using a number of criteria: the chi-square statistic, the root mean square error of approximation (RMSEA) with 90% confidence intervals (CIs), the comparative fit (CFI), and the standardized root mean square residual (SRMR). Rigorous thresholds were used to assess model fit: RMSEA $\leq$.06, CFI $\geq$.95, and SRMR $\leq$.08 indicate excellent fit.⁷⁵

The possibility of multivariate outliers was assessed using Mahalanobis distance (D^2). Two cases were identified as outliers ($P < .001$) and removed. Because the sample contained missing at random and nonnormal data, maximum likelihood parameter

Table 1 Description of Constructs, Measures, Scale Reliability, and Correlations

Item name	Item description	N	ρ	α	1	2	3	4	5	6	7	8	9	10	11	ATS
PE		5	.85	.86												
1. Sidewalk	No sidewalks				1.00	.53**	.53**	.50**	.49**	.24**	.27**	.17**	.36**	.18**	.10	.40**
2. Dangerous crossings	1+ dangerous crossings				.53**	1.00	.74**	.54**	.48**	.23**	.13*	.21**	.17**	.01	.13*	.39**
3. Traffic	Too much traffic				.53**	.74**	1.00	.62**	.53**	.35**	.26**	.28**	.21**	.04	.22**	.48**
4. Distance	Too far				.50**	.54**	.62**	1.00	.55**	.43**	.30**	.24**	.29**	.12	.12	.54**
5. Crossing guards	Crossing guards				.49**	.48**	.53**	.55**	1.00	.35**	.22**	.25**	.30**	.11	.12	.44**
ATT		3	.67	.56												
6. Enjoy	Enjoys walk/bike				.24**	.23**	.35**	.43**	.35**	1.00	.54**	.33**	.33**	.22**	.31**	.56**
7. Healthy	Healthy to walk/bike				.27**	.13*	.26**	.30**	.22**	.54**	1.00	.06	.33**	.20**	.22**	.35**
8. Ease drive	Easier to drive				.17**	.21**	.28**	.24**	.25**	.33**	.06	1.00	.07	-.11	.17**	.44**
SC		3	.50	.83												
9. Norm1	Other kids walk/bike alone				.36**	.17**	.21**	.29**	.30**	.33**	.33**	.07	1.00	.33**	.19**	.28**
10. Norm2	Other kids walk/bike with adult				.18**	.01	.04	.12	.11	.22**	.20**	-.11	.33**	1.00	.10	.09
11. Trust	Trust people in neighborhood				.10	.13*	.22**	.12	.12	.31**	.22**	.17**	.19**	.10	1.00	.23**

Abbreviations: ATS, active transportation to school; ATT, attitudes; PE, physical environment; SC, social capital. Note: All questions in PE, ATT, and SC constructs measured on a 7-point scale, where 1 = strongly disagree and 7 = strongly agree. All items in PE construct were reverse coded. See [Supplementary Material](#) (available online) for complete item wording. ρ = model estimated scale reliability.⁶⁹ α = Cronbach’s alpha.

* $P < .05$. ** $P < .01$.

estimates with SEs and a chi-square test statistic (MLR) was used to derive parameter estimates.⁷⁶ The sample met size recommendations of at least 10 cases per indicator variable.⁷⁷ In addition, the rule of at least 5 cases per parameters in a model was met.⁷⁸

Results

The initial measurement model had acceptable fit ($\chi^2_{49} = 133.263$, $P < .001$, $\chi^2:df = 2.72$; RMSEA = .083; 90% CI, .066–.100; CFI = .900; SRMR = .067). Some respecification was done post hoc in conjunction with theory and a modification index value greater than 10% of the chi-square of model fit.⁷⁹ Several items were found to be highly correlated; therefore, the covariance among the relationships that was sensible and aligned with theory was estimated in the model. Estimating the covariance between traffic and the presence of dangerous crossings improved the model fit ($\chi^2_{48} = 104.923$, $P < .001$, $\chi^2:df = 2.19$; RMSEA = .069; 90% CI, .051–.087; CFI = .932; SRMR = .062). In addition, the covariance between the ease of driving and ATS being healthy, as well as the covariances between all latent constructs, was estimated resulting in a final measurement model of good fit ($\chi^2_{47} = 90.880$, $P < .001$, $\chi^2:df = 1.93$; RMSEA = .061; 90% CI, .042–.080; CFI = .948; SRMR = .057), considering the complexity of the model and using conventional cut-off criteria.⁷⁵

The final structural model is illustrated in Figure 2. Paths between control variables and latent variables as well as covariance results have been omitted for illustrative parsimony. Full results are presented in Table 2. Chi-square difference testing between the measured and structural models resulted in a $\Delta\chi^2 = 10.966$. Two subhypotheses were also supported: the PE positively influenced ATS ($\beta = 0.391$; $P < .01$) (H_1) and ATT positively influenced ATS ($\beta = 0.535$; $P < .001$) (H_2). There was no significant relationship found between SC and ATS (H_3). Neither age nor gender was significantly associated with any construct.

Table 2 Structural Model Standardized Results (N = 248)

Path	Estimate	SE	Estimate/SE
Latent variables			
PE → ATS	0.397**	0.067	5.896
ATT → ATS	0.535**	0.094	5.663
SC → ATS	−0.118	0.106	−1.115
Measured variables			
Sidewalk → PE	0.0676**	0.042	16.023
Dangerous crossing → PE	0.676**	0.046	14.648
Traffic → PE	0.763**	0.039	19.7
Distance → PE	0.802**	0.034	23.464
Crossing guards → PE	0.718**	0.041	17.356
Enjoy → ATT	0.817**	0.042	19.265
Healthy → ATT	0.626**	0.047	13.331
Ease drive → ATT	0.452**	0.071	6.409
Norm1 → SC	0.711**	0.125	5.706
Norm2 → SC	0.420**	0.098	4.28
Trust → SC	0.339*	0.124	2.742
Covariates			
Age → ATS	0.022	0.047	0.465
Age → PE	−0.140	0.072	−1.962
Age → ATT	−0.004	0.080	−0.051
Age → SC	−0.095	0.098	−0.968
Gender → ATS	−0.019	0.047	−0.400
Gender → PE	0.110	0.070	1.579
Gender → ATT	0.094	0.077	1.217
Gender → SC	0.048	0.088	0.540

Abbreviations: ATT, attitudes; ATS, active transportation to school; PE, physical environment; SC, social capital.

* $P < .01$. ** $P < .001$.

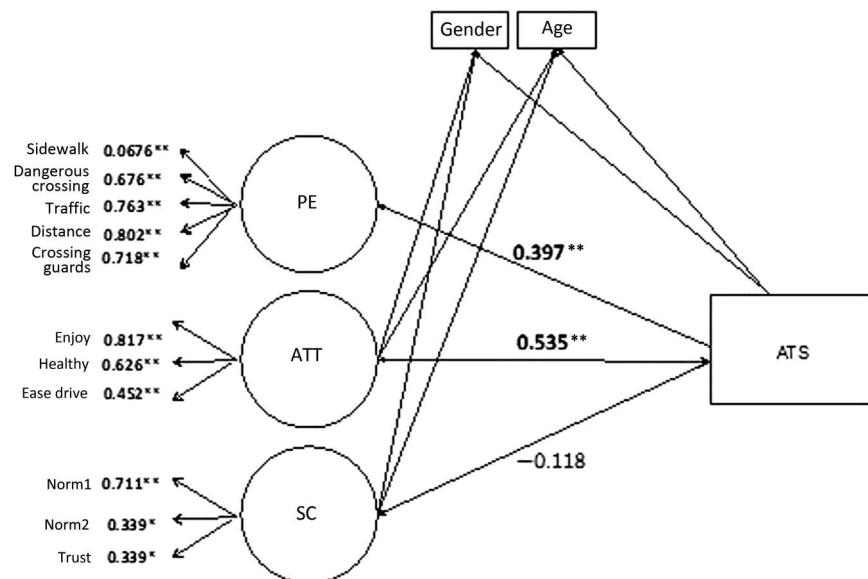


Figure 2 — Structural model of association between PE, ATT, SC, and ATS. Note: Significant results are presented in bold. * $P < .01$. ** $P < .001$. $\chi^2_{63} = 119.023$, $P < .001$, $\chi^2:df = 1.89$; RMSEA = .060; 90% CI, .043–.076; CFI = .937; SRMR = .055. ATS indicates active transportation to school; ATT, attitudes; CI, confidence interval; CFI, comparative fit; RMSEA, root mean square error of approximation; PE, physical environment; SC, social capital; SRMR, standardized root mean square residual.

Discussion

This study confirmed that parental ATT, the PE, and SC are effective constructs from which to conceptualize associations with ATS. Two of the 3 hypotheses were supported. Both ATT and the PE significantly contributed to ATS in a positive fashion. However, SC did not show a significant association with ATS. Neither age nor gender significantly impacted any associations within the model.

Attitudes

The results of this study confirm that parent ATT toward ATS are associated with travel behavior.⁵⁵ Lee et al⁸⁰ analyzed whether ATT surrounding ATS differed between parents of walkers versus drivers and found that parents who reported more positive measures of ATT (ie, enjoying walking to school) were more likely to choose walking for transportation, while parents who reported barriers (ie, driving to school being easier) were more likely to choose driving. These findings support the importance of programming efforts aimed at conveying the benefits of active transport to promote positive ATT among parents. In fact, having a positive ATT toward walking and biking may be powerful enough to overcome commonly reported environmental barriers such as distance.⁸⁰ In addition, ATT toward walking have been shown to influence the parental determination of what a “walkable” distance is⁸¹ and explain how the same environmental conditions are perceived differently depending on individual travel behavior.⁸²

Physical Environment

The results of this study support the significance of the PE as one of the most consistent influences on ATS.^{61,83} The benefits of subjective versus objective assessments of the environment have been deliberated considerably in the literature. Although there is merit to including both objective and subjective forms of measurement, several studies have suggested that perceived measures may be more adept at incorporating factors important to individuals⁸⁴ and may be more strongly linked to health behaviors,⁸⁵ including walking⁸⁶ and PA.⁸⁷ In this study, the PE construct was comprised of 5 subjectively measured items—each strongly connected to the underlying latent factor (as shown by the goodness-of-fit measurements)—supporting the notion that perceptions of the environment are an effective way to conceptualize associations with travel behavior to school.

Social Capital

Although SC did not prove to be significantly associated with ATS, the construct was revealed as a tenable avenue from which to further explore ATS. Of the 3 indicator variables, the norm of children walking to school was the strongest contributor to the construct. Although the association of norms and ATS is a relatively new concept, existing research consistently confirms that norms are positively related to PA behaviors.^{88,89} Future research should consider the role of additional factors (ie, gender) in the relationship, as 1 study found that boys were more likely to bike for recreation or transport, whereas girls were more likely to bike for recreation and walk to school when they had peers who lived locally and engaged in those behaviors.⁹⁰ Examining norms from both the parent and student perspectives may also be beneficial in

future research.⁹¹ Recognizing and celebrating students who do walk or bike may help to promote the perception that ATS is a normative and trusted form of school travel.

The lack of significance surrounding the relationship between SC and ATS has been reported in other studies⁹²; thus, it may be beneficial to elucidate and further expound upon the concept in future research. SC, albeit a popular and conspicuous term, is plagued with many different and vague definitions,⁹³ presenting challenges for conceptualization and measurement of the construct. Examining the construct using a more narrow lens and focusing on a specific dimension of SC (ie, sense of community or neighborhood)⁹³ may reveal more significant associations with ATS. For example, some preliminary research has reported that trust in the neighborhood community was positively related to using active transport.³⁰

Although this study aimed to identify SC as an indicator of ATS behavior, it is possible that the act of walking or biking to school might contribute to the SC within a neighborhood instead. A 2015 review of literature found that strong evidence exists between ATS programming efforts at school and social benefits,⁹⁴ such as getting to know neighbors.⁹⁵ A study of adults reported that residents living in walkable communities were more likely to know and trust their neighbors.⁹⁶ Similarly, active travel among adults has been found to promote social cohesion and social interaction within the neighborhood.⁹⁷ Future research should consider the possibility that SC is actually an outcome of ATS.

A major strength of this research is the use of the structured equation modeling approach to simultaneously investigate the associations between ATT, PE, SC, and ATS in 1 model. Nonetheless, the study has some limitations. Because cross-sectional data were utilized in this survey, longitudinal pathways could not be tested and causal conclusions cannot be made. Using longitudinal data would help to reveal patterns in the constructs over time and identify whether an increase or decrease in PE perceptions, parent ATT, or levels of SC has an effect on ATS. Subjectively measuring aspects of the PE is advantageous in identifying individual perception, but may present drawbacks in that an amplified correlation between constructs may exist due to perception bias.⁹⁸ For example, parents of children who walk or bike may be more inclined to have positive perceptions of the PE. Finally, it should be noted that the percentage of students using ATS in this sample (25.5%) was relatively high, likely due to the school district participation in Safe Routes to School programming.

Conclusion

This study offered a framework from which to conceptualize associations with ATS. Parental ATT, PE, and SC proved to be effective constructs from which to explore active travel behavior. Future research and programming efforts should incorporate these concepts and further expound on whether particular elements of SC or other related constructs have significant impacts on ATS.

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