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Dangaia Sims & Melissa Bopp

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Using parental active travel behavior and beliefs to predict active travel to school among children

Dangaia Sims and Melissa Bopp

Department of Kinesiology, Pennsylvania State University, University Park, PA, USA

ABSTRACT

Active travel (AT) is associated with improved health in adults and children, and children's AT to school has steadily declined in recent years. Understanding influences on AT will inform intervention development to increase AT among youth. Therein, this study aimed to examine the relationship between AT of children to school and parental AT behavior and beliefs. This was a cross-sectional study of employed adults conducted via an online survey. Participants reported the number of times per week their children, themselves and their spouses actively traveled. Beliefs for AT were also measured. Logistic regressions predicted child AT to school based on parental AT behavior and beliefs. Parents ($n = 344$) were primarily white (85.8%), female (66.3%), overweight or obese (48.0%) and married (82.6%), with high levels of income and education and reported that 12.2% ($n = 41$) of their children were active travelers. Children had higher odds of AT to school if the parent actively traveled (Odds ratio [OR] = 1.23 [1.12–1.34], $p<.001$) or the spouse was an active traveler (OR = 1.28 [1.14–1.45], $p<.001$). Speaking with children about reasons for AT (OR = 1.61 [1.19–2.18], $p=.002$), children being eager to actively travel to school (OR = 4.20 [2.82–6.25], $p<.001$), and parental AT as a child (OR = 1.29 [1.03–1.60], $p=.02$) were associated with more AT, and odds of children actively traveling to school were lower with higher parent body mass index (OR = 0.87 [0.79–0.96], $p=.005$) and more cars in the household (OR = 0.47 [0.30–0.72], $p=.001$). These findings suggest that children's AT to school is directly influenced by the travel behavior, attitudes, and beliefs of parents.

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Active travel; children; commuting; parents; school; social environment

Introduction

The association between physical activity (PA) and health benefits has been well-documented in both adults and children (United States Department of Health and Human Services, 2008). Meeting these guidelines for physical activity has been associated with obesity prevention (Flynn et al., 2006), cardiovascular disease risk reduction (Andersen et al., 2006), good mental health (Biddle, Gorely, & Stensel, 2004), and better academic performance (Taras, 2005). Despite the known benefits of PA, rates remain low among children (United States Department of Health and Human Services, 2008). Active travel (AT; i.e., walking and biking) has been shown to be a useful technique to meet PA recommendations and improve health in adults and children (Davison, Werder, & Lawson, 2008; Gordon-Larsen et al., 2009). Additionally, communities with greater AT also have improved air quality, less pollution and traffic and experience economic benefits associated with greater walking and biking (Rails to Trails Conservancy, 2008). Nevertheless, according to national data, rates of AT to school have been consistently declining over the last half century (Davison et al., 2008). Currently less than one-third of children living within one mile of school walked (Centers for Disease Control and Prevention, 2002) and national data indicates that in 2009 12.7% of students in kindergarten through 8th grade walked or biked to school, compared with more than 40% in 1969 (McDonald, Brown, Marchetti, & Pedroso, 2011).

A social ecological framework is useful in understanding the influences on AT, considering factors at the individual, social, environmental, community and policy levels (Sallis et al., 2006; Sallis et al., 2015). Greater research has examined demographics trends (e.g., age, gender, and race) in AT and the environment or policy compared with social factors. Previous research on social influences indicated that parental commuting habits, attitudes and schedule remain among the most influential on AT to school for children (Carver et al., 2005; Davison et al., 2008; Lu et al., 2014; Te Velde et al., 2017). Other social factors include having others to actively travel with, likely related to safety concerns from crime (Carver et al., 2005; Timperio et al., 2006; Zhu, Arch, & Lee, 2008; Zhu & Lee, 2009). From an environmental perspective, the availability of programing to support AT to school, like Safe Routes to School campaigns, which focus on both engineering (i.e., infrastructure) and encouragement for AT are positive influences (Lee, Yoon, & Zhu, 2016). Other notable environment influences include: weather, the presence of a steep hill, concerns about safety from traffic, the availability of supportive infrastructure to support AT and distance to school (Carlson et al., 2014; Chillon et al., 2014;

CONTACT Melissa Bopp Mjb73@psu.edu Department of Kinesiology, Pennsylvania State University, University Park, PA 16801, USA

Davison et al., 2008; Lu et al., 2014; Timperio et al., 2006; Zhu et al., 2008; Zhu & Lee, 2009).

Due to the marked declines in AT among children, understanding the influences on AT will inform intervention development to increase AT among youth. Further, as parents have a major influence on their children's health and health behaviors, it is important to examine how parental AT and related correlates predict AT among their children. Accordingly, this study aimed to examine the relationship between AT of children to school and parental AT behavior and beliefs.

Methods

This was a cross-sectional study of employed adults conducted via an online survey distributed using Qualtrics software (Provo, UT). Data were collected from June to December 2011. Detailed methods are published elsewhere (Bopp, Kaczynski, & Campbell, 2013).

Participants and recruitment

Recruitment took place primarily in the mid-Atlantic United States (PA, OH, WV, MD, NJ, and DE). This was a convenience sample of employees who worked for large employers in the regions (e.g., school districts and local/regional government) who were willing to help in recruiting participants. Individuals over the age of 18, who were employed outside the home, and were physically able to walk or bike, were eligible for participation in the study. Individuals who reported having one or more school-aged children living at home with them were included in the present study.

Measures

Parent travel modes

Participants reported the number of times per week walked, biked, driven, or took public transit to and from work for themselves and their spouses. The number of total trips was summed and parents were categorized as an active traveler if they reported one or more trip/week via walking or biking. One or more trip a week was used to classify active travel status due to the distribution of responses among those who reported any AT trips; the none/any dichotomization was most reflective of responses.

Demographics and health

Participants reported on their sex, marital status, education level, age, number of cars in the household, height and weight (body mass index [BMI] was calculated), number of chronic health conditions, and their perceived health status (1 = poor to 5 = excellent).

Psychosocial influences

Spouse normative beliefs for AT were measured using a 5-point Likert scale (1 = strongly disagree and 5 = strongly agree) to respond to four statements about AT: "My spouse/partner and I discuss issues related to walking and biking to work," "I value what my spouse/partner thinks about the way I travel to work," "I have an opinion on the way my spouse/partner travels to and from work," and "My spouse/partner influences my choice on how I travel to and from work" (Conn, Tripp-Reimer, & Maas, 2003). Participants were also asked to report their self-efficacy (confidence) for bicycling with a 5-point scale (1 = not at all confident to 5 = very confident).

Community and environmental influences: Using a 5-point Likert scale participants indicated how pedestrian and bicycle friendly (1 = not at all to 5 = very much) there community was. Participants indicated (yes/no) the number of supports for cycling in their community (e.g., bike racks on public transit, share the road signs), which was summed. Walk and bike time to work was reported and dichotomized as </>20 min.

Child travel modes: Participants also reported separately per child (if applicable) the number of times in a typical week their children walked, bike, were driven, or took public transit to and from school, their child's age and distance to their school (categorized as 0–0.5 miles, 0.5–1 mile, 1–1.5, and >1.5 miles). Children were categorized as being an active traveler if they walked or bike to/from school one or more day week, with the same rationale as described above with parents AT participation. Finally, participants responded to a series of 12 questions on a five-point scale (1 = strongly disagree and 5 = strongly agree) regarding individual normative beliefs on AT as it relates to their children (Table 1). Parents were categorized as having no children that actively travel or having one or more child that actively travel.

Statistical analyses

Descriptive statistics and frequencies described the sample. Separate logistic regressions were used to predict if a parent had a child that engaged in AT to school for the parental AT behavior and beliefs. All analyses were performed using SPSS 23.0 (Armonk, NY). Given the number of analyses conducted, we used a Bonferroni correction and set significance levels were set at $p < .01$.

Results

The demographics of the sample are shown in Table 1. A total of 1,234 individuals completed the survey, though only individuals who reported having school aged children ($n = 344$, 27.9% of the original sample) were included in the analyses outlined above.

All results are listed in Table 2. Parents had had higher odds of having a child who actively traveled to school if the parent was an active traveler (odds ratio [OR] = 1.23 [1.12–1.34], $p < .001$) or the parent had a spouse who was

Table 1. Sample characteristics ($n = 344$).

Variable	Mean (SD)	n (%)
Age, years	42.87 (6.99)	
BMI	26.25 (5.02)	
Overweight or obese		165 (48.0)
White		295 (85.8)
Female		228 (66.3)
Married		284 (82.6)
Income > $60,000/year		
College graduate or more		274 (79.7)
Perceived walk time to work > 20 minutes		282 (82.0)
Perceived bike time to work > 20 minutes		222 (64.5)
Number of people in family	3.42 (0.80)	
Parent number of times/week AT	0.94 (2.66)	
Spouse, number of times/week AT	0.80 (2.47)	
Spouse, AT beliefs normative summary score (range 4–20)	10.48 (4.31)	
Number of chronic diseases	0.65 (0.90)	
Parental self-efficacy for biking skills	2.87 (1.03)	
Parental perceived behavioral control (range 6–42)	20.02 (7.65)	
Perceived health status (range 1–5)	3.60 (0.78)	
Parental perceived community pedestrian friendliness (range 1–5)	3.11 (1.30)	
Parental perceived community bicycle friendliness (range 1–5)	3.01 (1.27)	
Sum of community supports (range 0–3)	1.24 (0.94)	
Number of cars in household	3.22 (0.85)	
Child AT normative beliefs (range 1–5)		
I speak with my children about reasons for AT	2.85 (1.24)	
My children eager to AT to school	2.33 (1.18)	
My neighborhood is safe from crime	3.89 (1.06)	
My neighborhood is safe from traffic	3.09 (1.26)	
I share with my children why I use my way of travel to work	2.91 (1.21)	
I feel I'm a good role model	3.44 (0.97)	
My/my spouse's schedule impacts child travel	3.50 (1.32)	
When I was a child I used to AT	2.87 (1.58)	
Most children in our neighborhood AT	1.78 (1.04)	
Most children in our neighborhood drive/ride bus	4.20 (1.15)	
I believe my children get enough PA	3.65 (1.20)	
I believe my children are too sedentary	2.95 (1.21)	

BMI: body mass index; AT: active travel.

an active traveler (OR = 1.28 [1.14–1.45], $p < .001$). Higher odds of having actively traveling children was also associated with greater parental perceived behavioral control (OR = 1.07 [1.03–1.11], $p = .001$), greater parental perceived community pedestrian friendliness (OR = 1.49 [1.11–2.11], $p = .007$) and bicycle friendliness (OR = 1.34 [1.00–1.78], $p = .047$), and more community supports for AT (OR = 2.06 [1.39–3.04], $p < .001$). Speaking with children about reasons for AT (OR = 1.61 [1.19–2.18], $p = .002$), children being eager to actively travel to school (OR = 4.20 [2.82–6.25], $p < .001$), neighborhood safety from crime (OR = 1.80 [1.18–2.74], $p = .006$), neighborhood safety from traffic (OR = 1.57 [1.17–2.11], $p = .003$), closer reported distance to school (OR = 0.26 [0.10–0.69]), sharing with children why the parent travels to work in the mode that they do (OR = 1.57 [1.17–2.11], $p = .003$), parental beliefs that they are a good role model to their children (OR = 1.65 [1.13–2.42], $p = .01$), and most children in the neighborhood actively traveling (OR = 3.07 [2.24–4.20], $p < .001$) were associated with higher odds of having a child who actively travels.

Alternatively, odds of having a child actively traveling to school were lower with higher parent BMI (OR = 0.87 [0.79–0.96], $p = .005$), more cars in the household (OR = 0.47 [0.30–0.72], $p = .001$), and more children in the neighborhood driving or taking the bus to school (OR = 0.45 [0.33–0.58], $p < .001$). Variables not significantly related to having an actively traveling child included: parental AT beliefs, parental participation in AT as a child, parental perceived health status, number of chronic diseases in the parents, parental self-efficacy for biking skills, perceived community supports for AT, parental/spousal schedule impacting their child's travel, believing their child gets enough PA, and believing their child is too sedentary.

Discussion

This study revealed a number of interesting relationships between parental AT behavior and beliefs and child AT behavior. There is strong evidence that participating in AT results in positive health outcomes for children, underscoring the importance of focusing on AT (Davison et al., 2008; Lubans, Boreham, Kelly, & Foster, 2011).On the whole, greater child AT behavior was predicted by greater parental AT behavior and stronger positive parental AT beliefs. It is important to understand the influence of parents on their children's AT behavior.

Multiple studies have assessed the relationship between parental PA and child PA, in general finding that more active children have more active parents (Moore et al., 1991; Yang, Telama, & Laakso, 1996), and children with active parents were two to three times as likely to be active as compared to children with inactive parents. However, limited research has examined the relationship between parent

Table 2. Parental variables predicting having an actively traveling child ($n = 344$).

Variable	OR	95% CI
Parental AT	1.23***	1.12–1.34
Spousal AT	1.28***	1.14–1.45
Parental AT beliefs	0.99	0.96–1.06
Parental BMI	0.87**	0.79–0.96
Parental perceived behavioral control	1.07**	1.03–1.11
Parental perceived health status	1.21	0.78–1.86
Parent number of chronic disease	1.01	0.71–1.45
Parental self-efficacy for biking skills	1.40	0.97–2.00
Parental perceived community pedestrian friendliness	1.49**	1.11–2.11
Parental perceived community bicycle friendliness	1.34*	1.00–1.78
Spousal normative beliefs for AT	1.36***	1.18–1.57
Number of cars in household	0.47**	0.30–0.72
Sum of community supports for AT	2.06***	1.39–3.04
Perceived community supports for AT	1.03	0.96–1.10
Reported distance to school		
<0.5 miles (referent)	1	
0.5–1 mile	0.26**	0.10–0.69
1–1.5 miles	0.07***	0.02–0.20
1.5–2 miles	0.003***	0.00–0.02
Child AT normative beliefs		
I speak with my children about reasons for AT	1.61**	1.19–2.18
My children eager to AT to school	4.20***	2.82–6.25
My neighborhood is safe from crime	1.80**	1.18–2.74
My neighborhood is safe from traffic	1.57**	1.17–2.11
I share with my children why I use my way of travel to work	1.57**	1.17–2.11
I feel I'm a good role model	1.65**	1.13–2.42
My/my spouse's schedule impacts child travel	0.87	0.68–1.11
When I was a child I used to AT	1.29	1.03–1.60
Most children in our neighborhood AT	3.07***	2.24–4.20
Most children in our neighborhood drive/ride bus	0.45***	0.33–0.58
I believe my children get enough PA	0.86	0.66–1.12
I believe my children are too sedentary	0.85	0.64–1.12

**$p < 0.01$,
***$p < 0.001$,
AT: active travel; BMI: body mass index.

AT and child travel mode. Previous work has examined different parental factors related to children's AT; Cooper, Page, Foster, and Qahwaji (2003) note that children's travel behavior decisions are likely made by the parents. Other studies have found parental restrictions on children's movement can influence AT (Henne, Tandon, Frank, & Saelens, 2014). Still, these results point to the importance of further examining this relationship.

The current study also noted the importance of parental beliefs for AT to school. In alignment with our results, previous research has found that greater environmental supports and parental support for PA correlate with higher levels of PA among children (Sallis, Prochaska, & Taylor, 2000) and there is a negative correlation between parental anxiety about environmental safety and children's PA levels (Weir, Etelson, & Brand, 2006). These findings highlight the importance of both the social and physical environment of the neighborhood as it relates to children's safety while being active underscores the importance of perceived versus actual environment with this population. Communities aiming to address both child and adult active travel should follow frameworks that address a wide range of needs and abilities, including Complete Streets Initiatives which help to address planning an infrastructure that help contribute to perceived safety and decreased pedestrian and cyclist accidents and fatalities (Smart Growth American and National Complete Streets Coalition, 2016). Safe Routes to School programs also have the potential to address some of these barriers, encompassing both the environment through engineering strategies as well as encouraging behavior change through education and encouragement (National Center for Safe Routes to School, 2018). The Safe Routes to School National Partnership also provides insightful report cards to states which can provide a foundation for planning around encouraging AT for children with potential impact on adults' AT as well (Lieberman, Pasillas, Pedroso, Williams, & Zimmerman, 2018). These findings suggest that efforts to promote AT have implications across multiple age groups and should consider policy and environmental change along with programmatic efforts to address beliefs and social norms.

Our results showed that children have lower odds of actively traveling if their parents have a high BMI, if there are more cars in the household, or if more children in the neighborhood are driven or ride the bus to school. A strong relationship exists between parental and child obesity, with more obese children tending to have more obese parents who tend to be less physically active (Fogelholm, Nuutinen, Pasanen, Myöhänen, & Säätelä, 1999). Accordingly, the relationship between lack of AT among children and higher parental BMI is unsurprising. Number of cars in the household, self-efficacy, and social support for AT have been noted to be determinants of AT among children in previous studies, in line with current findings (Black et al., 2001; Kim, Lee, Lu, & Mendoza, 2017; Panter, Jones, Van Sluijs, & Griffin, 2010; Panter et al., 2008). The overlap with parental

support and children's AT was also noted by Mah et al.(2017), along with the importance of a perceived supportive physical environment. School health professionals and public health practitioners could apply this information to develop family-oriented interventions and programs to build confidence and skills for AT and create social norms within the family for AT participation. Further studies should examine a broad range of influences to comprehensively examine what factors could impact children's AT in order to develop effective programs to target this behavior.

Despite the significant findings, this study is not without limitations including the cross-sectional design, volunteer sample, self-report measures, homogenous sample, and low rates of AT among participants. Given the low rates of AT for children we were unable to separate out child specific trends (e.g., age), limiting our ability to fully understand this relationship. Additionally we were unable to document other social influences (e.g., neighborhood cohesion; Salahuddin et al. 2016) which have been noted to be related to children's AT. Also, we did not adjust the analyses for other factors which could have allowed for determining the most influential variables. Lastly, the sample was not very ethnically or economically diverse, limiting our ability to generalize our results. This is problematic in that income/education and race/ethnicity are known to be a significant influence on AT participation for both children and adults. Further studies should see to recruit a more diverse sample.

Limitations notwithstanding, results from this study may be useful in better targeting AT. Not only is this information useful in promoting existing AT programs for communities such *Safe Routes to School* and *Complete Streets*, this information may also prove beneficial in providing preliminary data for developing AT programs and interventions for parents to increase rates of AT among their children. Improvements in education, policy, and environmental changes supporting AT among both adults and children are also necessary to ensure improvements in AT behaviors and beliefs. Initiatives focused on promoting AT among children have been used around the world; a review of interventions promoting AT to school noted many environmental and policy level strategies, though few studies have also included parent AT habits as a part of their strategies, suggesting a significant gap in the literature (Pang et al., 2017).

These findings suggest that AT to school among children is directly influenced by the travel behavior, attitudes, and beliefs of their parents. These findings also highlight the importance of improving AT correlates among adults to increase AT among their children, suggesting the importance of partnerships between community coalitions focused on AT, schools, worksites, urban planners and public health officials for addressing walking and biking participation across the lifespan.

Disclosure statement

The authors declare there is no conflict of interest.

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