Parental and Adolescent Perceptions of Neighborhood Safety Related to Adolescents’ Physical Activity in Their Neighborhood

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Abstract

Purpose—The purpose of this study was to examine the association between adolescent and parental perceptions of neighborhood safety and adolescents’ physical activity in multiple locations and to investigate the moderating effect of sex within this association.

Method—This cross-sectional study was conducted with 928 adolescents aged 12 to 16 years old and 1 of their parents. Adolescents and parents reported their perceptions of neighborhood safety (traffic safety, pedestrian safety, crime safety, and stranger danger safety). Adolescents reported how often they were physically active in multiple locations (physical activity in the neighborhood, in parks, and for active transport). Mixed-effects linear regression models were used to investigate these associations while controlling for demographics and the Walkability Index.

Results—Parent-perceived crime safety was positively associated with adolescents’ physical activity in parks (B = .094, p = .024). Parent-perceived traffic safety was positively associated with adolescents’ reported physical activity in the neighborhood (B = .186, p = .014). Adolescents’ physical activity for active transport was positively associated with parent-perceived traffic safety (B = .179, p = .001), stranger danger safety (B = .110, p = .013), and crime safety (B = .077, p = .035). There were 2 interactions by sex on the relation between adolescent traffic safety perception and parent pedestrian safety perception in the neighborhood and adolescents’ physical activity in parks (i.e., statistically significant only for boys).
Conclusions—Parents’ perceptions of traffic, stranger danger, and crime safety were all related to adolescents’ active transportation. Multiple safety concerns may be motivating parents to restrict adolescent mobility by walking and bicycling.

Keywords
Built environment; crime; social environment; traffic

The U.S. Department of Health and Human Services recommends that youth accumulate at least 60 min daily of physical activity (U.S. Department of Health and Human Services, 2008). However, the shift from childhood to adolescence is the period of life with the greatest decline in physical activity (Kwon, Janz, Letuchy, Burns, & Levy, 2015; Nader, Bradley, Houts, McRitchie, & O’Brien, 2008). Less than 20% of adolescents in the United States meet the recommended level of both aerobic and muscle-strengthening activities (Song, Carroll, & Fulton, 2013).

A growing body of literature suggests that neighborhood environments may play a key role in adolescents’ recreational physical activity and walking or biking for transportation (Committee on Environmental Health, 2009; Ding, Sallis, Kerr, Lee, & Rosenberg, 2011). The built environment (e.g., design of communities, road networks, bicycle paths, sidewalks, buildings, and open spaces) and the social environment of a community influence adolescents’ opportunities for physical activity (Centers for Disease Control and Prevention, 2011; Committee on Environmental Health, 2009).

An important aspect of the neighborhood social environment is safety in several specific domains (e.g., traffic safety, pedestrian safety, crime safety, and stranger danger safety). Literature reviews on perceived crime-related safety and traffic safety in youth as well as adults have revealed inconsistent associations with physical activity (Ding et al., 2011; Foster & Giles-Corti, 2008). For example, one study showed that children’s physical activity in public recreation spaces was positively associated with parental perceptions of safety from crime (Tappe, Glanz, Sallis, Zhou, & Saelens, 2013). Another study revealed no association between adolescents’ safety perception from crime and active transport in their neighborhood (De Meester, Van Dyck, De Bourdeaudhuij, Deforche, & Cardon, 2013). Inconsistent evidence might be due to the fact that parents and adolescents have different perceptions of safety, and the relationship between safety and physical activity may vary depending on who reports the perception (Sallis & Glanz, 2006; Tappe et al., 2013).

Another limitation of most studies is that the physical activity measures used in safety studies in adolescents were not specific to location (e.g., neighborhood, park, school; Ding et al., 2011). A reasonable hypothesis is that perceptions of neighborhood safety would be most related to youth physical activity in neighborhoods and less related to physical activity in other places, such as parks, recreation facilities outside the neighborhood, and schools. Therefore, it is likely that separately investigating the association between parent and adolescent safety perceptions of neighborhoods and adolescent physical activity in the neighborhood may help clarify the associations. The present study examined the association between adolescent and parental perceptions of neighborhood safety and adolescents’ physical activity in multiple locations. Because levels of overall physical activity and safety

Res Q Exerc Sport. Author manuscript; available in PMC 2018 January 25.
perceptions differ by sex (Ding et al., 2012; Ortega et al., 2013), the association between physical activity and safety perceptions may differ between boys and girls, so we investigated the moderating effect of sex.

Methods

Neighborhood selection and participants

Participants were recruited for the Teen Environment and Neighborhood (TEAN) Study conducted during 2009 to 2011 in two diverse geographical regions: Baltimore, MD–Washington, DC, and Seattle–King County, WA. This observational epidemiologic study was designed to assess neighborhood environment correlates of physical activity, sedentary behavior, dietary behaviors, and weight status in adolescents aged 12 to 16 years old.

Walkability for each block group was calculated using Geographic Information Systems (GIS) measures of residential density, street connectivity, retail floor area ratio, and land use mix, similar to methods described previously (Frank et al., 2010). GIS variables were normalized within each region, and z scores were summed to create the Walkability Index for each block group. A median split was used to define higher- and lower-walkability block groups. In addition, Census 2000 data on median household income were used to identify higher- and lower-income block groups, again using median splits. Walkability and median household income classifications were then crossed to categorize block groups into quadrants representing high/low walkability by high/low median income. Households within the identified block groups were contacted using information from a commercial marketing firm. Teen and parent pairs were recruited from these households approximately equally across the walkability-by-income quadrants.

The sampling was designed to be balanced by age and sex and to approximate the ethnic distribution of the regions. Eligible adolescents could not have physical disabilities that would restrict their physical activities, eating disorders, or developmental disabilities. Parents and adolescents were informed by letter about the study, eligibility was determined during telephone calls, and written informed consent and adolescent assent were provided. Participants’ anonymity was preserved by assigning an identification number for each participant. The TEAN study was approved by the Institutional Review Boards at San Diego State University and Seattle Children’s Research Institute following the ethical standards recognized by the Declaration of Helsinki (reviewed in Seoul, Republic of Korea, in October 2008).

The participation rate (i.e., returned surveys divided by eligible contacts) was 36% and did not vary significantly by quadrant. This participation rate was comparable to a similarly designed study of adults (Sallis et al., 2009), and the modest rates reflect a substantial respondent burden of completing surveys and wearing multiple electronic monitors for at least 1 week. When participants’ household demographics were compared to census data, the study sample was found to have higher education and household income compared with residents in the census block groups in which participants lived. Regarding race/ethnicity, the adolescent sample was comparable to census data for adolescents, with 34% of participants being racial/ethnic minorities versus 37% of adolescents in their census block.

Res Q Exerc Sport. Author manuscript; available in PMC 2018 January 25.
groups. However, only 26% of study parent/caregivers were minorities, compared with 37% of adults in the same census block groups.

**Household demographics**

Adolescents’ age, sex, weight and height (used to calculate body mass index [BMI] percentile), and race/ethnicity (categorized here as Non-White or Hispanic or White Non-Hispanic) were collected from an adolescent survey. Parents’ education (categorized here as university level or below university level), marital status (categorized here as married/living together or other), vehicles per adult in the household, and months living in the neighborhood were collected from a parent survey.

**Walkability Index for each participant**

The Walkability Index measures a pattern of characteristics of the built environment that contribute to residents’ ability to walk to destinations. An individual-level Walkability Index was created for the 500-m street network buffer around each participant’s residence, based on the same GIS data used for neighborhood selection. Data from the county tax assessor, regional land use at the parcel level, and street networks were integrated into GIS to derive built environment features. Residential density (housing units per residential land area), intersection density (intersections per square kilometer), retail floor area ratio (building square feet/parcel square feet, with higher values reflecting more pedestrian-oriented design), and mixed use (includes residential, retail, food and entertainment, and office land use types; 0 = single use and 1 = even distribution across the five uses) were calculated for the buffer around each participant’s residence (Saelens et al., 2012). The Walkability Index for each participant was derived from the sum of z scores of the aforementioned four measures within each participant’s buffer area (Frank et al., 2010).

**Parent and adolescent neighborhood safety perceptions**

Both parents and adolescents completed the subset of the Neighborhood Environment Walkability Scale for Youth that assessed perceptions of neighborhood safety on four scales with the following items.

- Traffic safety: (a) Traffic makes it unpleasant to walk, (b) speed of traffic on most streets is usually slow, (c) most drivers go faster than the posted speed limits.
- Pedestrian safety: (a) Streets have good lighting at night, (b) walkers and bikers can be easily seen by people in their homes, (c) there are crosswalks and signals on busy streets, (d [only for adolescents]) I feel safe crossing the streets in my neighborhood.
- Crime safety: (a) There is a high crime rate.
- Stranger danger safety: There is a fear of being taken or hurt by a stranger (a) in a local park; (b) on local streets; (c) in my yard, driveway, or apartment common area; (d) in my neighborhood (Rosenberg et al., 2009).
Response options ranged from 1 = strongly disagree to 4 = strongly agree, with higher numbers representing perceptions of greater safety. The items for crime safety, traffic safety, and stranger danger safety perceptions from both parents and adolescents were reverse-scored so higher scores represent better perceptions of safety. Test–retest intercorrelation coefficients (ICCs) for adolescent safety perceptions ranged from .56 to .87, and for parents, they ranged from .61 to .78 (Rosenberg et al., 2009).

Adolescent physical activity in the neighborhood
Adolescents reported how often they were physically active in multiple locations. Response options ranged from 0 to 5 (0 = never; 1 = once a month or less; 2 = once every other week; 3 = once a week; 4 = two or three times per week; and 5 = four or more times per week). Items were summarized on three scales. First, responses for frequency of physical activity in driveways/alleys, neighborhood yards or driveways, streets or sidewalks, and nearby cul-de-sacs or dead-end streets were averaged to produce the “Physical Activity in Neighborhood” Scale. Test–retest ICCs for items ranged from .37 to .65 (Joe, Carlson, & Sallis, 2012).

Second, frequency of physical activity in parks and park-like environments was averaged across items to assess frequency of paths/trails, small public parks/playgrounds, large public parks, and open spaces for physical activity to create the “Physical Activity in Parks” Scale. Test–retest ICCs for items ranged from .39 to .52 (Joe et al., 2012).

Third, walking and biking for transportation were assessed through nine questions inquiring about frequency of transportation by active modes to several places: indoor recreation or exercise facility, friend or relative’s house, outdoor recreation facility, food store or restaurant/cafe, other retail stores, nonschool social or educational activities, public transportation stop, work, and other places. Responses were averaged to create the “Physical Activity for Active Transport” Scale. Test–retest kappas for items ranged from .29 to .45 (Joe et al., 2012).

Statistical analysis
Descriptive statistics are presented as mean (SD) or percentages. All outcome variables were checked for skewness of distribution before the analyses. Differences between sexes were tested using linear mixed-effects model regression and logistic mixed-effects regression for continuous and nominal outcomes, respectively.

Paired t tests were used to examine the relationships between parent and adolescent safety perceptions of the neighborhoods. Cohen’s effect size statistics (d) as standardized mean differences between parent and adolescent safety perceptions and 95% confidence intervals were calculated. Cohen’s d values of 0.2, 0.5, and 0.8 are considered small, medium, and large effects, respectively (Cohen, 1988).

The associations of parent neighborhood safety perceptions (traffic safety, pedestrian safety, crime safety, and stranger danger safety) and adolescent physical activity (physical activity in the neighborhood, in parks, and for active transport) were separately analyzed using mixed-effects linear regression with census block group as a random cluster effect and site, adolescent sex, age, BMI percentile, race/ethnicity, parent marital status, parent education,
vehicle per adult in the household, time in neighborhood, and walkability as fixed effects. We also conducted similar mixed-effects linear regression models to examine the associations between adolescent neighborhood safety perceptions and adolescent physical activity. The regression coefficients ($B$) describe the association between neighborhood safety perception variables and adolescent physical activity variables; a one-unit change in neighborhood safety perception is expected to produce $B$ units of change in adolescent physical activity.

Interaction terms were examined to assess the effect modification of adolescent sex on the relation between parent and adolescent safety perception variables and adolescent physical activity outcomes. A $p$ value < .10 was used to interpret the significance of interactions (Cox, 1984). Significant interactions were graphed by plotting mean scores for the predicted physical activity scales across safety tertiles in each variable comprising the interaction. Analyses were performed using the IBM Statistical Package for the Social Sciences Statistics Version 18.0 for Windows, and the level of significance for main effects was set at $p < .05$.

### Results

Boys reported higher levels of physical activity in the neighborhood, in parks, and for active transportation compared with girls. Boys’ parents perceived higher stranger danger safety (i.e., perceiving that a situation is safe) than did girls’ parents. Adolescent boys reported higher crime and stranger danger safety perceptions than did girls (Table 1). In addition, adolescents had higher safety perceptions than their parents on all four neighborhood safety variables, with a small effect size for crime safety ($d < 0.20$) and a medium effect size for traffic, pedestrian, and stranger danger safety ($d < 0.50$; Table 2).

Parent traffic safety perception was positively associated with adolescents’ reported physical activity in the neighborhood ($B = .186$). There was a positive association between parent crime safety perception of the neighborhood and adolescents’ physical activity in parks ($B = .094$). Physical activity for active transport was positively associated with parent-perceived traffic safety ($B = .179$), crime safety ($B = .077$), and stranger danger safety ($B = .110$) of their neighborhoods. A negative interaction was found between parent-perceived pedestrian safety and sex of the adolescent for the outcome of physical activity in parks ($B = −.286$, $p = .009$; Table 3). The relationship between pedestrian safety and physical activity in parks was positive for boys ($B = .170$, $p = .036$) and nonsignificant for girls ($B = −.123$, $p = .115$; Figure 1).

Adolescent-perceived pedestrian safety showed a positive trend with physical activity for active transport ($B = .105$). An interaction was found between adolescent-perceived traffic safety and adolescent sex for the outcome on physical activity in parks ($B = .283$, $p = .015$; Table 4). The relationship between traffic safety and physical activity in parks was negative for boys ($B = −.195$, $p = .039$) and nonsignificant for girls ($B = .078$, $p = .304$; Figure 2).
Discussion

The present results extend previous results in several ways. Parent perceptions of neighborhood safety were more often related to adolescent physical activity than were adolescent perceptions of safety. This finding suggests the parent gatekeeper function could be an important influence on adolescent physical activity. Multiple parent safety perception measures were associated with active transportation, suggesting several parent concerns may help explain often-studied limitations on youth mobility (Carver, Timperio, Hesketh, & Crawford, 2010). The overall pattern of results indicated that parent perceptions of neighborhood safety were related to location-specific adolescent physical activity within neighborhoods. In fact, the present study showed more consistent associations with location-specific adolescent physical activity within neighborhoods than previous studies have shown with youth physical activity measures that were not specific to location (Datar, Nicosia, & Shier, 2013; Ding et al., 2011; Weir, Etelson, & Brand, 2006). These findings support the behavior-specific nature of environment–behavior associations (Sallis, Owen, & Fisher, 2008).

Associations between perceived neighborhood safety and adolescent physical activity were heterogeneous. After adjusting for possible confounders, five significant tests supported a conclusion that parents’ safety perceptions of their neighborhoods were related to adolescent physical activity in the neighborhood. The neighborhood-specific physical activity measures (physical activity in the neighborhood, active transport) were specifically related to parents’ perceptions of traffic safety. It is possible that neighborhood physical activity often occurs in streets, so it is likely to be impacted by traffic and traffic safety perceptions. These findings suggest that methods to increase neighborhood safety such as traffic-calming devices (i.e., narrower lanes, traffic circles, and speed humps) could be an effective intervention for increasing adolescent physical activity in neighborhoods. By contrast, physical activity in parks, which may or may not be in the neighborhood, was not related to parent safety perceptions in the main effects. The present analyses point to a limitation of previous studies and suggest the potential benefits of measuring environmental correlates and physical activity for the same location (e.g., safety perceptions of neighborhoods and physical activity in neighborhoods).

There were no significant main effects for adolescent safety perceptions or any physical activity outcome. One possible explanation for the inconsistency between parent and adolescent safety perceptions in relation to adolescent physical activity is that youth at these ages, particularly girls, lack autonomy regarding independent mobility (Karsten, 2005). Adolescents generally believed their neighborhoods were relatively safe, but parents may have restricted youths’ physical activity in the neighborhood due to parents’ perceptions of lower safety in neighborhoods (Davison & Lawson, 2006; Gustafson & Rhodes, 2006). More study on the parents’ gatekeeper role for adolescent physical activity is needed to generate ideas for interventions.

Adolescent physical activity for active transport was the only outcome associated with three of the four parent safety perceptions (traffic safety, crime safety, and stranger danger safety).
Thus, there were multiple parental safety concerns that might lead them to restrict adolescents’ active travel.

Previous studies have shown parent safety perception as a combination of different domains of safety (Datar et al., 2013; Foster & Giles-Corti, 2008; Kerr et al., 2006; Nichol, Janssen, & Pickett, 2010; Weir et al., 2006), so it is difficult to compare previous findings to present domain-specific results. A recent review showed that associations between adolescent physical activity and traffic safety perception were more consistently supported than associations with crime-related safety (Ding et al., 2011). However, some studies have been consistent with the present findings. Santos et al. found that parent pedestrian safety perceptions were related to children’s independent mobility, whereas the combined fear of strangers, crime, and traffic safety was not related to children’s independent mobility (Santos, Pizarro, Mota, & Marques, 2013). Research on youth independent mobility is growing rapidly. The present findings suggest multiple safety concerns may contribute to reductions in adolescent independent mobility. Therefore, it is important to develop strategies for improving parent safety perceptions for adolescents’ active travel such as implementing safe routes to school, designing easy places to walk, or offering low-cost community walking programs (U.S. Department of Health and Human Services, 2015). In addition, one avenue for further exploration is the extent to which parents consider likely negative effects of restricting their adolescents’ active travel, such as the health risks of inactivity.

Previous studies have not explored youth physical activity within neighborhoods or specific domains of physical activity (e.g., active transport, physical activity for leisure), which could account for the primarily null findings in previous studies (Ding et al., 2011). It was expected that perceptions of neighborhood safety would be more related to youth physical activity in neighborhoods and less related to physical activity in other places, such as recreation facilities outside the neighborhood or schools. The present results support the hypothesis as some previous studies have. A previous study showed that parent perceptions of neighborhood crime safety were associated with higher levels of children’s physical activity in parks (Tappe et al., 2013), which was consistent with the present study’s findings. Another study showed that parent perceptions of safe road environments were positively associated with walking and biking among 10- to 12-year-olds (Timperio, Crawford, Telford, & Salmon, 2004), also similar to the present finding that traffic safety was related to adolescent active transport as well as physical activity in the neighborhood. We recommend that studies measure physical activity in specific contexts to improve the sensitivity of the analyses. A complement to the present measures of self-reported physical activity in specific locations would be to use global positioning system (GPS) devices.

The only difference in parents’ safety perceptions by adolescent sex was for stranger danger, with parents perceiving higher stranger safety for their boys. Similar sex differences were found for adolescents’ safety perceptions, and boys also perceived greater safety from crime than did girls. The effect of sex as a moderator variable of associations was significant only in two cases, both involving parks. Parent-perceived pedestrian safety was only related to physical activity in parks for boys, suggesting that improved pedestrian infrastructure might encourage parents to allow their boys to go to nearby parks. Such interventions might not be
sufficient for parents to allow their adolescents to go to parks for physical activity. Surprisingly, adolescent perceptions of neighborhood traffic safety appeared to be a barrier for boys to be physically active in parks. It may be that boys are content to play around their homes rather than going to parks when there are low concerns about traffic safety close to home. These interactions point to the need to consider different strategies for overcoming perceived safety barriers to physical activity of girls and boys.

Limitations of the present study include its cross-sectional design, which precludes drawing conclusions on the direction of the associations. Safety perceptions and physical activity variables were all self-reported, so findings must be interpreted with caution. Matching physical activity to physical activity locations using GPS monitoring is a logical next step that could provide new insights. Though self-report is the appropriate measurement mode for safety perceptions, it would also be useful to examine other measures of safety variables, such as crime rates in neighborhoods and parks as well as traffic volume and pedestrian injury or fatality rates. The present study had strengths such as the use of a relatively large and heterogeneous sample, inclusion of potential confounder variables (including a GIS-based assessment of walkability), and assessment of physical activity within multiple neighborhood locations.

In conclusion, the results support that parent safety perceptions of neighborhoods were related to adolescents’ location-specific physical activity, even after adjustment for demographics and the Walkability Index. It appeared that several domains of parent safety concerns could lead them to restrict their adolescents’ active travel. Because parent safety perceptions were related to adolescent physical activity, it would be useful to identify the environmental or social cues that affect those safety perceptions and could be improved by interventions. Such interventions might involve collaborations between public safety, transportation, and public health professionals and community residents. Different safety-enhancement strategies may be needed to increase the neighborhood physical activity of girls and boys.

What does this article add?

The current study used measures of physical activity in multiple locations and appeared to reveal more consistent associations with perceptions of neighborhood safety compared with previous studies that used physical activity measures not specific to location. Thus, the present study supports the ecological model principle of behavior-specific associations between environments and physical activity (Sallis et al., 2008). Reduced independent mobility among youth is a health concern, and the present study showed that active travel was related to multiple safety concerns of parents. These findings suggest intervention strategies need to be explored to improve active travel opportunities for adolescents.

References


Figure 1.
Sex interaction between parent pedestrian safety perception and adolescents’ physical activity in parks. *Mean scores for the predicted physical activity scale across safety tertiles.
Figure 2.
Sex interaction between adolescent traffic safety perception and adolescents’ physical activity in parks. *Mean scores for the predicted physical activity scale across safety tertiles.
## Table 1

Characteristics of the study sample.

<table>
<thead>
<tr>
<th></th>
<th>All</th>
<th>Boys</th>
<th>Girls</th>
<th>p for sex</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>n</strong></td>
<td>928</td>
<td>460</td>
<td>468</td>
<td></td>
</tr>
<tr>
<td><strong>Adolescents characteristics</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age (years)</td>
<td>14.10 ± 1.40</td>
<td>14.03 ± 1.39</td>
<td>14.16 ± 1.40</td>
<td>.225</td>
</tr>
<tr>
<td>Race (% White-Non Hispanic)</td>
<td>66</td>
<td>66</td>
<td>67</td>
<td>.727</td>
</tr>
<tr>
<td>BMI percentile(^a)</td>
<td>63.80 ± 26.81</td>
<td>64.55 ± 27.92</td>
<td>63.07 ± 25.70</td>
<td>.392</td>
</tr>
<tr>
<td><strong>Parent characteristics</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Parent education university or more (%)</td>
<td>64</td>
<td>63</td>
<td>65</td>
<td>.405</td>
</tr>
<tr>
<td>Marital status (% married/live with partner)</td>
<td>84</td>
<td>85</td>
<td>83</td>
<td>.244</td>
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<tr>
<td>Vehicle per adult</td>
<td>1.02</td>
<td>1.04</td>
<td>1.00</td>
<td>.119</td>
</tr>
<tr>
<td>Walkability Index in 500 m (sum of z scores)(^b)</td>
<td>20.04 ± 2.63</td>
<td>20.22 ± 2.37</td>
<td>0.12 ± 2.85</td>
<td>.284</td>
</tr>
<tr>
<td>Time in neighborhood (months)</td>
<td>169.10 ± 93.11</td>
<td>174.63 ± 100.14</td>
<td>163.61 ± 85.31</td>
<td>.076</td>
</tr>
<tr>
<td><strong>Parent safety perceptions(^c)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Traffic safety (1–4)</td>
<td>2.58 ± 0.58</td>
<td>2.60 ± 0.56</td>
<td>2.56 ± 0.60</td>
<td>.283</td>
</tr>
<tr>
<td>Pedestrian safety (1–4)</td>
<td>2.83 ± 0.65</td>
<td>2.85 ± 0.68</td>
<td>2.82 ± 0.63</td>
<td>.509</td>
</tr>
<tr>
<td>Crime safety (1–4)</td>
<td>3.09 ± 0.88</td>
<td>3.14 ± 0.88</td>
<td>3.05 ± 0.89</td>
<td>.159</td>
</tr>
<tr>
<td>Stranger danger safety (1–4)</td>
<td>3.01 ± 0.73</td>
<td>3.10 ± 0.72</td>
<td>2.92 ± 0.72</td>
<td>&lt; .001</td>
</tr>
<tr>
<td><strong>Adolescent safety perceptions(^c)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Traffic safety (1–4)</td>
<td>2.73 ± 0.61</td>
<td>2.75 ± 0.58</td>
<td>2.71 ± 0.64</td>
<td>.219</td>
</tr>
<tr>
<td>Pedestrian safety (1–4)</td>
<td>3.10 ± 0.52</td>
<td>3.13 ± 0.51</td>
<td>3.08 ± 0.53</td>
<td>.217</td>
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<tr>
<td>Crime safety (1–4)</td>
<td>3.21 ± 0.91</td>
<td>3.29 ± 0.88</td>
<td>3.13 ± 0.93</td>
<td>.007</td>
</tr>
<tr>
<td>Stranger danger safety (1–4)</td>
<td>3.38 ± 0.74</td>
<td>3.56 ± 0.64</td>
<td>3.20 ± 0.79</td>
<td>&lt; .001</td>
</tr>
<tr>
<td><strong>Adolescent physical activity in the neighborhood (frequency rating)(^d)</strong></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Physical activity in the neighborhood (0–5)</td>
<td>1.55 ± 1.35</td>
<td>1.85 ± 1.39</td>
<td>1.25 ± 1.25</td>
<td>&lt; .001</td>
</tr>
<tr>
<td>Physical activity in parks (0–5)</td>
<td>1.45 ± 1.08</td>
<td>1.60 ± 1.15</td>
<td>1.30 ± 1.00</td>
<td>&lt; .001</td>
</tr>
<tr>
<td>Physical activity for active transport (0–5)</td>
<td>1.37 ± 0.97</td>
<td>1.50 ± 1.00</td>
<td>1.25 ± 0.92</td>
<td>&lt; .001</td>
</tr>
</tbody>
</table>

**Note.** Values are mean±SD or percentages. p for sex adjusted for block group identifier as random clustering effect. Statistically significant values are shown in bold. BMI = body mass index.

\(^a\) BMI-for-age percentile on a Centers for Disease Control and Prevention BMI-for-age growth chart.

\(^b\) z score computed as the sum of z-scores of residential density, intersection density retail floor area ratio and mixed use.

\(^c\) Safety perceptions ranged from 1 = strongly disagree to 4 = strongly agree.

\(^d\) Adolescent physical activity ranged from 0 = never to 5 = four or more times per week.
Table 2
Paired *t* test for adolescent and parental safety perceptions of neighborhoods.

<table>
<thead>
<tr>
<th>Safety perceptions</th>
<th>Adolescents</th>
<th>Parents</th>
<th>Mean differences [95% CI]</th>
<th><em>p</em></th>
<th>Cohen’s <em>d</em> values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Traffic safety (1–4)</td>
<td>2.73 ± 0.61</td>
<td>2.58 ± 0.58</td>
<td>0.148 [0.100, 0.196]</td>
<td>&lt; .001</td>
<td>0.20</td>
</tr>
<tr>
<td>Pedestrian safety (1–4)</td>
<td>3.10 ± 0.52</td>
<td>2.83 ± 0.65</td>
<td>0.270 [0.223, 0.318]</td>
<td>&lt; .001</td>
<td>0.37</td>
</tr>
<tr>
<td>Crime safety (1–4)</td>
<td>3.21 ± 0.91</td>
<td>3.09 ± 0.88</td>
<td>0.120 [0.056, 0.183]</td>
<td>&lt; .001</td>
<td>0.12</td>
</tr>
<tr>
<td>Stranger danger safety (1–4)</td>
<td>3.38 ± 0.74</td>
<td>3.01 ± 0.73</td>
<td>0.369 [0.313, 0.426]</td>
<td>&lt; .001</td>
<td>0.42</td>
</tr>
</tbody>
</table>

*Note.* Mean differences computed as adolescent safety perceptions minus parent safety perceptions. Statistically significant values are shown in bold.
Table 3

Association between adolescent physical activity in neighborhoods and parent safety perception in neighborhoods (n = 928).

<table>
<thead>
<tr>
<th>Safety perceptions</th>
<th>Physical activity around neighborhood</th>
<th>Physical activity in park</th>
<th>Physical activity for active transport</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>B</td>
<td>p</td>
<td>B</td>
</tr>
<tr>
<td>Traffic safety</td>
<td>.186</td>
<td>.014</td>
<td>.118</td>
</tr>
<tr>
<td>Pedestrian safety</td>
<td>.026</td>
<td>.702</td>
<td>—</td>
</tr>
<tr>
<td>Crime safety</td>
<td>.015</td>
<td>.771</td>
<td>.094</td>
</tr>
<tr>
<td>Stranger danger safety</td>
<td>.078</td>
<td>.202</td>
<td>.081</td>
</tr>
</tbody>
</table>

Note. Values are regression coefficients (B). Analyses were adjusted by site (Baltimore/Seattle), adolescent sex (years), body mass index percentile, and race/ethnicity (Non-White/White Non-Hispanic); parent marital status (married/living with partner/non-married/living with partner), parent education (university level/below university level), vehicle per adult in the household (number of vehicles), time in neighborhood (months), and Walkability Index in 500m (sum of z scores) were fixed effects, and block group identifier was the random clustering effect. Statistically significant values are shown in bold, and borderline significant values are shown in italics.

*aInteraction term; see Figure 1 for sex-moderated effects.
### Table 4

Association between adolescent physical activity in neighborhoods and adolescent safety perception in neighborhoods ($n = 928$).

<table>
<thead>
<tr>
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<th>Physical activity around neighborhood</th>
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<tbody>
<tr>
<td></td>
<td>$B$</td>
<td>$p$</td>
<td>$B$</td>
</tr>
<tr>
<td>Traffic safety</td>
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<td>.605</td>
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</tr>
<tr>
<td>Pedestrian safety</td>
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<td>.935</td>
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</tr>
<tr>
<td>Crime safety</td>
<td>.014</td>
<td>.782</td>
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</tr>
<tr>
<td>Stranger danger safety</td>
<td>.031</td>
<td>.618</td>
<td>.070</td>
</tr>
</tbody>
</table>

Note. Values are regression coefficients ($B$). Analyses were adjusted by site (Baltimore/Seattle), adolescent sex, age (years), body mass index percentile, and race/ethnicity (Non-White/White Non-Hispanic); parent marital status (married/living with partner/non-married/living with partner), parent education (university level/below university level), vehicle per adult in the household (number of vehicles), time in neighborhood (months), and Walkability Index in 500m (sum of $z$ score) were fixed effects, and block group identifier was the random clustering effect. Borderline significant values are shown in italics.

*a Interaction term; see Figure 2 for sex-moderated effects.