

Is There a Relationship Between Perceived Neighborhood Contentedness and Physical Activity in Young Men and Women

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ABSTRACT *The relationship between perceived neighborhood contentedness and physical activity was evaluated in the Add Health study population. Wave I includes 20,745 respondents (collected between 1994 and 1995) and wave II includes 14,738 (71 %) of these same students (collected in 1996). Multinomial logistic regression was used to evaluate this relationship in both wave I and wave II of the sample. Higher levels of Perceived Neighborhood Contentedness were associated with higher reports of physical activity in both males and females and in both waves. For every one-point increment in PNS, males were 1.3 times as likely to report being highly physically active than low (95 % CI 1.23–1.37) in wave 1 and 1.25 times as likely in wave 2 (95 % CI 1.17–1.33). Females were 1.17 (95 % CI 1.12–1.22) times as likely to report being highly active than low and 1.22 times as likely in wave 2 (95 % CI 1.17–1.27) with every one-point increment. PNC appears to be significantly associated with physical activity in adolescents. Involving the community in the development of intervention programs could help to raise the contentedness of adolescents in these communities.*

KEYWORDS *Neighborhood safety, Physical activity, Epidemiology, Social cohesion, Adolescent health*

INTRODUCTION

An active lifestyle is an important behavioral factor that can help to reduce many adverse health outcomes and promote healthy functioning.²⁸ This is not only true in adults but also in adolescents.²⁴ A lack of physical activity may lead to obesity-related health problems in adulthood including heart disease, diabetes, respiratory illness, and some forms of cancer.^{3, 9, 16, 20, 22, 30} Therefore, it is important for public health professionals to understand and consider potential barriers to physical activity in adolescents and adults.²⁵ One potential barrier of interest is perceived neighborhood contentedness. Perceived neighborhood contentedness is an overall comfort level that the adolescent has and incorporates their feelings of safety, familiarity, and comfort. An adolescent may choose to participate in other activities during their leisure time if they do not feel safe or content in their neighborhood.

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There has been no work looking at perceived neighborhood contentedness; however, a similar measure is perceived neighborhood safety. Studies have been conducted that aim to better evaluate the potential barrier between perceived neighborhood safety (one aspect of neighborhood contentedness) and physical activity. Results are mixed on whether perceived neighborhood safety may be a barrier to physical activities in children. A study by Bennett et al. showed a relationship between perceived neighborhood safety and self-reported physical activity in both genders, though activity was only lower in males at night.² A study conducted by Velasquez et al. evaluated the relationship between perceived safety factors and leisure time physical activity and showed that neighborhood safety was a significant predictor of activity, but only in women.²⁹ Humbert et al. used student focus groups and the children reported neighborhood safety as a significant barrier to their physical activity.¹⁵ This relationship has been shown in parent's perceptions as well. Bringolf-Isler et al. found a significant relationship between parental perceptions of neighborhood safety and their willingness to allow their children to play outside.⁵ A study conducted by Romero et al. showed a positive relationship between perceived neighborhood hazards and physical activities, but only in high SES subjects.²⁶ Three other studies conducted in various subgroups, however, showed no significant relationship between perceived neighborhood safety and physical activity.^{1, 18, 23} Although these studies indicate that perceived neighborhood factors are a barrier to physical activity, they are not uniform. In addition, they come from smaller subsets of the population. A study looking at the relationship between perceived neighborhood contentedness and physical activity in a large, nationally representative survey of adolescents would fill this gap.

In addition, understanding individual level views of the neighborhood may provide additional clues about how personal experiences and perspectives may lead to fear or uncertainty, independent of objective neighborhood measures themselves.²¹ The aim of this study is to examine the relationship between perceived neighborhood contentedness and physical activity in adolescents. We choose to evaluate contentedness, as opposed to safety alone because it incorporates other aspects of neighborhood perception which may be important in adolescent behavior. We have chosen the Add Health dataset because of its large and diverse sample of a nationally representative population and its relevant survey questions. In the past, researchers have attempted to capture this information by developing indices of neighborhood feelings, most notably Sampson with his measure of "collective efficacy".²⁷ This analysis utilized a measure that is similar but catered more toward adolescents.

METHODS

Sample

The National Longitudinal Study of Adolescent Health (Add Health) dataset is a nationally representative, longitudinal survey of adolescents as they transition into adulthood. These data were collected at multiple time points.¹³ The first two waves evaluated the study participants during adolescence (1-year apart) while the latter waves followed them as they transitioned through adulthood. Wave I included survey results from 20,745 respondents (collected between 1994 and 1995). Wave II data was collected for 14,738 (71 %) of these same students (collected in 1996).

Study design

A cross-sectional study design was used to evaluate the relationship between perceived neighborhood contentedness and physical activity patterns in the study population. Analysis of both wave I and wave II of the Add health Study was done separately.

Independent measures

In the previous research conducted by Bazaco et al. factor analysis was used to evaluate the relationship between a set of variables taken from the Add health Survey concerning neighborhood contentedness. Exploratory factor analysis defined the neighborhood contentedness domain, from a collection of potential variables in wave I. Confirmatory factor analysis was done on these questions in wave II of the study and validated this index. The factor analysis is described in greater detail here (Bazaco et al.).

In order to assess perceived neighborhood contentedness, five questions from the Add health survey were used. These questions are as follows:

1. Do you know the people in your neighborhood?
2. In the past 12 months have you stopped to talk to people in your neighborhood?
3. Do people in your neighborhood stick up for each other?
4. Do you feel safe in your neighborhood?
5. Are you happy living in your neighborhood?

These questions were used to create a PNC index. This measure incorporates aspects of neighborhood safety (question 4), social cohesion (questions 1 and 2), and collective efficacy (question 3), as described above.^{7, 27} The responses for these five questions were summed using the dichotomous (0 or 1) outcomes with a maximum value of 5. The higher the sum, the more content the subject feels in his/her neighborhood. In contrast, a lower sum indicates a lower level of contentedness. This sum was used as the PNC measure and treated as such throughout the study. Future references to point increases in this variable will refer to a 1 point increase in the PNC index.

Dependent measures

To assess physical activity in this study, we utilized multiple variables assessed in the Add Health dataset. These variables have been used to assess the physical activity in other studies conducted using this data set.^{4, 14, 19} The survey asked how often an individual took part in the following activities:

- rollerblading, skating, skateboarding, and bicycling
- active sports such as baseball, football, basketball, and soccer
- outdoor exercise, jogging, walking, jumping rope, dancing, or karate

The responses to the question ranged from not at all to five or more times.

These responses were scored as such:

Not at all = 0

1 or 2 times = 1.5

3 or 4 times = 3.5

5 or more times = 5

An overall variable was calculated to assess the total number of times an individual participated in physical activity over the course of the prior week, and this was used in the analysis. We summed the values for each of the three measures of physical activity for each respondent. This has been done in previous literature using this dataset.^{8, 10, 11} Since the survey question asks for the frequency of physical activity and not duration, categorical cutoffs were used as the independent measure.

We looked at the combined variable as a three level dependent variable. The cutoffs for this variable are as follows:

High physical activity ≥ 5 bouts in past 7 days

Moderate physical activity 3–4 bouts in past 7 days

Low physical activity < 3 bouts in past 7 days

This value was used as the independent measure or physical activity measure in this study.

Potential covariates

Potential covariates, such as age, gender, race, Hispanic status, parental education, household income, parental marital status, and whether or not English was spoken at home were also assessed. These variables have all been shown to be associated with physical activity patterns.^{6, 12, 17} Self-reported health, how frequent the subject felt fearful or cried, how often the subject repeated a grade in school, and how often the students had missed a social event because of illness or self-reported physical limitations were also considered as potential covariates. Interaction terms for gender and neighborhood contentedness and violent experience and neighborhood contentedness were included in the models.

We also assessed an individual's experience with violent activities. The survey asked how often each subject had witnessed a shooting or stabbing, had a knife pulled on them, shot or stabbed someone, been shot at, been stabbed, gotten in a fight, gotten jumped, or pulled a knife on someone. These variables were dichotomized by whether or not the subject had at least one experience. They were then added together to form an index. These variables were included in a previously described factor analysis to validate their use as a measure (Bazaco et al. paper 1 above). The index was labeled "Violent Experience" (VE) and included as a potential covariate for this analysis. The values ranged from 0 to 7 with the higher the value for VE, the more experience with violence the subject had.

Statistical analysis

Multinomial logistic regression was used for multivariate analysis. Gender was shown to have a significant interaction with the independent variable of interest (PNC) in the full model ($p < 0.001$), so separate models were made for males and females. In addition, models were built for each wave of the study to determine if there was any difference as the cohort aged.

Bivariate analysis was used to determine what variables should be included in the initial model. Variables were included if they were related to the outcome variable at a significance of 0.20 or less. Dummy variables were used when adding non-dichotomous, non-ordinal, and categorical variables to the model. These included race, household income, and parental education. After each model was run, the variable with the highest global p value was removed and the model was run again. The final model consisted of variables with a p value of 0.10 or lower for any

TABLE 1 Individual level characteristics of add health population at waves I and II

	Wave I <i>N</i> (%)	Wave II <i>N</i> (%)
Neighborhood contentedness		
Low	3684 (18.2 %)	2761 (19.1 %)
Moderate	8458 (40.8 %)	6159 (42.6 %)
High	8114 (40.1 %)	5553 (38.4 %)
Violent experience	8594 (41.9 %)	4132 (28.5 %)
Gender		
Male	10,263 (49.5 %)	7182 (48.7 %)
Female	10,480 (50.5 %)	7556 (51.3 %)
Age (SD)	15.66 (1.8 %)	16.22 (1.6 %)
Race		
White	12,379 (59.9 %)	8936 (60.9 %)
African American	4696 (22.7 %)	3267 (22.2 %)
Asian	1463 (7.1 %)	245 (1.7 %)
Native American	331 (1.6 %)	1003 (6.8 %)
Other	1801 (8.7 %)	1231 (8.4 %)
Hispanic	3525 (17.0 %)	
English spoken at home		
Yes	18,364 (88.6 %)	
No	2371 (11.4 %)	
Parents married	12,310 (69.9 %)	
BMI (SD)	22.58 (4.5 %)	22.97 (4.7 %)
Parental income		
<20,000	7397 (39.2 %)	
20–40,000	4722 (25.0 %)	
40–60,000	3551 (18.8 %)	
60–80,000	1733 (9.2 %)	
>80,000	1455 (7.7 %)	
Parental education level		
Did not graduate high school	3040 (17.3 %)	
High school or equivalent	5270 (30.1 %)	
Some college or equivalent	5190 (29.6 %)	
College graduate	2463 (14.0 %)	
Post-graduate professional	1564 (8.9 %)	
Generally healthy (self report)	13,931 (67.2 %)	10,101 (68.6 %)
Frequently cries	1378 (6.6 %)	1091 (7.4 %)
Frequently feels fearful	1363 (6.6 %)	837 (5.7 %)
Repeated a grade in school	4655 (22.5 %)	
Difficulty using hands and feet (self report)	579 (2.8 %)	

outcome level. If a variable had been retained in at least one model, it was included in the final models for all comparisons in that wave and gender.

RESULTS

Study sample

Nineteen percent of the study population was classified as having low levels of neighborhood contentedness in both wave I and wave II. The remaining 80 % were evenly distributed between moderately and highly content with their neighborhood. Forty-two percent of the study population had at least one violent experience within the past year in wave I of the study, but dropped to 28 % at the time of wave II. Table 1 shows the demographic characteristics of the population at both wave 1 and wave 2.

TABLE 2 Effect of neighborhood contentedness on physical activity goals in girls at wave I of the add health population

	Low to moderate physical activity AOR (95 % CI) (n = 3424)	Moderate to high physical activity AOR (95 % CI) (n = 6450)	Low to high physical activity AOR (95 % CI) (n = 6574)
Neighborhood contentedness	1.07 (1.02–1.12)*	1.11 (1.06–1.16)*	1.18 (1.14–1.24)*
Violent experience	1.05 (0.85–1.30)	1.24 (1.03–1.48)*	1.30 (1.08–1.55)*
Age	0.83 (0.80–1.87)*	0.86 (0.83–0.88)*	0.71 (0.68–0.74)*
Race (ref. white)			
African American	0.79 (0.67–0.94)*	0.91 (0.79–1.05)	0.72 (0.63–0.83)*
Asian	1.20 (0.87–1.66)	0.97 (0.74–1.26)	1.16 (0.88–1.53)
Native American/ Pacific Islander	1.04 (0.58–1.88)	1.58 (0.99–2.54)	1.65 (1.03–2.66)*
Other	0.94 (0.70–1.27)	1.11 (0.86–1.44)	1.05 (0.82–1.34)
Hispanic	0.96 (0.74–1.23)	0.83 (0.67–1.03)	0.79 (0.64–0.98)*
English spoken at home	1.14 (0.86–1.50)	0.92 (0.72–1.17)	1.04 (0.83–1.32)
Parents married	–	–	–
BMI	1.11 (1.01–1.22)*	1.00 (0.92–1.10)	1.11 (1.02–1.21)*
BMI ²	0.998 (0.996–1.000)	1.00 (0.99–1.00)	0.998 (0.996–0.999)
Parental income (ref = 20–40,000 annual)	–	–	–
<20,000			
40–60,000			
60–80,000			
>80,000			
Parental education level (ref = college graduate)			
Did not graduate high school	0.94 (0.72–1.22)	0.96 (0.77–1.20)	0.90 (0.72–1.12)
High school or equivalent	0.96 (0.76–1.20)	0.85 (0.70–1.02)	0.81 (0.67–0.98)*
Some college or equivalent	1.01 (0.81–1.27)	0.99 (0.82–1.19)	1.00 (0.83–1.21)
Post-graduate professional	1.22 (0.90–1.66)	1.07 (0.84–1.37)	1.31 (1.01–1.69)
Generally healthy (self report)	1.21 (1.05–1.39)*	1.43 (1.27–1.62)*	1.73 (1.53–1.95)*
Frequently cries	–	–	–
Frequently feels fearful	0.72 (0.56–0.92)*	1.27 (1.02–1.57)*	0.91 (0.75–1.10)
Repeated a grade in school	1.21 (1.01–1.45)*	0.96 (0.82–1.12)	1.16 (0.99–1.36)
Difficulty using hands and feet (self report)	0.68 (0.44–1.04)	1.47 (0.96–2.26)	0.99 (0.71–1.38)

CI confidence interval, AOR adjusted odds ratio; neighborhood contentedness and violent experience interaction tested for and not significant; physical activity defined as high ≥ 5 bouts per week, moderate = 3–4.5 bouts per week, low < 3 bouts per week

*P < 0.05

The results for wave I females can be seen in Table 2. A significant positive relationship is evident between the level of neighborhood contentedness and physical activity. This is consistent in all three models, when controlling for other factors. The adjusted odds of girls being in the moderately active group when compared to the low group was 1.07 (95 % confidence interval [CI] = 1.02–1.12). This is consistent, adjusted odd’s ratio (AOR) = 1.11 (95 % CI = 1.06–1.16), when comparing those in

TABLE 3 Effect of neighborhood contentedness on physical activity goals in boys at wave I of the add health population

	Low to moderate physical activity (n = 2015)	Moderate to high physical activity (n = 6573)	Low to high physical activity (n = 6454)
	AOR (95 % CI)	AOR (95 % CI)	AOR (95 % CI)
Neighborhood contentedness	1.08 (1.01–1.16)*	1.19 (1.13–1.25)*	1.29 (1.22–1.36)*
Violent experience	1.06 (0.86–1.31)	1.38 (1.18–1.61)*	1.46 (1.24–1.73)*
Age	0.86 (0.81–0.91)*	0.82 (0.78–0.85)*	0.70 (0.67–0.73)*
Race (ref. white)			
African American	1.09 (0.86–1.40)	1.09 (0.91–1.31)	1.19 (0.97–1.46)
Asian	0.89 (0.59–1.33)	1.46 (1.07–2.01)*	1.30 (0.95–1.79)
Native American/ Pacific Islander	1.46 (0.67–3.19)	0.99 (0.57–1.70)	1.44 (0.75–2.80)
Other	1.23 (0.82–1.84)	0.94 (0.70–1.28)	1.16 (0.84–1.61)
Hispanic	0.78 (0.55–1.10)	1.40 (1.07–1.82)*	1.09 (0.83–1.43)
English spoken at home	0.64 (0.44–0.93)*	1.10 (0.83–1.45)	0.70 (0.52–0.96)*
Parents married	0.99 (0.80–1.24)	0.83 (0.70–0.98)*	0.83 (0.69–0.99)*
BMI	1.10 (0.99–1.21)*	1.08 (0.99–1.18)	1.18 (1.08–1.29)*
BMI ²	0.99 (0.997–1.00)	0.99 (0.99–1.0)	0.99 (0.995–0.99)*
Parental income (ref = 20–40,000 annual)			
<20,000	0.92 (0.72–1.17)	1.06 (0.88–1.27)	0.97 (0.80–1.18)
40–60,000	0.91 (0.71–1.16)	1.25 (1.03–1.50)*	1.13 (0.93–1.38)
60–80,000	0.87 (0.63–1.20)	1.38 (1.08–1.76)*	1.20 (0.93–1.55)
>80,000	1.10 (0.78–1.57)	1.34 (1.04–1.73)*	1.48 (1.11–1.98)*
Parental education level (ref = college graduate)	–	–	–
Did not graduate high school			
High school or equivalent			
Some college or equivalent			
Post-graduate professional			
Generally healthy (self report)	1.51 (1.25–1.82)*	1.51 (1.30–1.75)*	2.29 (1.96–2.66)*
Frequently cries	1.25 (0.65–2.41)	0.60 (0.36–1.54)*	0.74 (0.42–1.32)
Frequently feels fearful	–	–	–
Repeated a grade in school	–	–	–
Difficulty using hands and feet (self report)	–	–	–

CI confidence interval, AOR adjusted odds ratio; neighborhood contentedness and violent experience interaction tested for and not significant; physical activity defined as high ≥ 5 bouts per week, moderate = 3–4.5 bouts per week, low < 3 bouts per week

* $P < 0.05$

the highly physically active group to the moderate one. When comparing the highly physically active group to the low group, the AOR was 1.18 (95 % CI = 1.14–1.24).

The results for males at wave I can be seen in Table 3. A significant positive relationship is evident between the level of neighborhood contentedness and physical activity level. This is consistent in all three comparisons, when controlling for other factors. Boys had an AOR of 1.08 (95 % CI = 1.01–1.16) for being in the

moderately physically active group when compared to the low. The AOR was larger, 1.19 (95 % CI = 1.13–1.25), when comparing the moderate physically active group to the high group. When comparing the low group to the high group, boys had an AOR of 1.29 (95 % CI = 1.22–1.36) for being in the high group when they were more content.

The results for females at wave II can be seen in Table 4. A significant positive relationship is evident between the level of neighborhood contentedness and physical activity. This is consistent in all three comparisons, when controlling for various external factors. The adjusted odds of girls being in the moderately physically active group when compared to the low group was 1.11 (95 % CI = 1.05–1.17). This was similar when comparing those in the highly physically active group to the moderate one at 1.11 (95 % CI = 1.06–1.17). When comparing the low physically active group to the high group, the AOR was 1.22 (95 % CI = 1.03–1.44).

The results for males at wave II can be seen in Table 5. A significant positive relationship is evident between the level of neighborhood contentedness and physical activity level. This is consistent in all three comparisons, when controlling for various external factors. Boys had an AOR of 1.15 (95 % CI = 1.07–1.23) for being in the moderately physically active group when compared to the low. The AOR was lower, 1.09 (95 % CI = 1.04–1.16) when comparing the highly physically active group to the moderate group. When comparing the low group to the high group, boys had an AOR of 1.25 (95 % CI = 1.18–1.33) for being in the high group when they were more content.

Violent experience was also significantly associated with physical activity level in both waves and across both genders. The higher the level of violent experience that the subjects were exposed to, the higher the odds that they would be in the high physical activity group compared to the low and moderate activity groups for boys and girls in wave I. This was similar in wave II for both boys and girls, though the association was only significant in the change from low to high activity levels.

Other specific variables remained significantly associated with physical activity at all levels in the model in both waves and for both males and females. Age was negatively associated with increases physical activity in each comparison in each group. In addition, an increase in self-reported health was significantly associated with increased odds of being in the higher physical activity group at each level of the comparison. African-American girls were significantly less likely to be in the moderate or high activity group than the low group. This was not significant in either wave for males.

DISCUSSION

In this study, we evaluated the potential relationship between perceived neighborhood contentedness and physical activity in adolescents from the Add Health data set. To do this, we used a scale of contentedness previously validated (data not shown). Overall, the results of the study indicate that there is a relationship between perception of neighborhood contentedness and physical activity in adolescents. This relationship is evident in both males and females but differs in magnitude between genders. The magnitude of the relationship also varies between different levels of activity (low, moderate, and high).

For girls, the relationship was slightly more pronounced when looking at the transition from moderate physical activity to high physical activity (wave I OR = 1.07, wave II OR = 1.12) than it was from low to moderate (wave I OR = 1.11, wave

TABLE 4 Effect of neighborhood contentedness on physical activity goals in girls at wave II of the add health population

	Low to moderate physical activity AOR (95 % CI) (n = 2673)	Moderate to high physical activity AOR (95 % CI) (n = 4752)	Low to high physical activity AOR (95 % CI) (n = 4833)
Neighborhood contentedness	1.11 (1.05–1.17)*	1.11 (1.06–1.17)*	1.23 (1.17–1.29)*
Violent experience	1.04 (0.85–1.27)	1.17 (0.99–1.38)	1.22 (1.03–1.44)*
Age	0.82 (0.78–0.86)*	0.80 (0.77–0.84)*	0.66 (0.63–0.69)*
Race (ref. white)			
African American	0.70 (0.58–0.86)*	0.76 (0.64–0.90)*	0.54 (0.45–0.64)*
Asian	1.20 (0.84–1.71)	0.86 (0.64–1.17)	1.04 (0.76–1.42)
Native American/Pacific Islander	1.73 (0.95–3.17)	0.72 (0.45–1.16)	1.25 (0.72–2.18)
Other	1.26 (0.90–1.78)	0.79 (0.59–1.07)	1.0 (0.74–1.35)
Hispanic	0.79 (0.60–1.04)	0.99 (0.78–1.25)	0.78 (0.62–0.98)*
English spoken at home	–	–	–
Parents married	1.14 (0.96–1.36)	0.89 (0.76–1.04)	1.01 (0.87–1.18)
BMI	1.25 (1.12–1.38)*	1.03 (0.94–1.13)	1.28 (1.17–1.40)*
BMI ²	0.997 (0.995– 0.998)*	0.999 (0.997– 1.003)	0.996 (0.994– 0.997)*
Parental income (ref = 20–40,000 annual <20,000	–	–	–
40–60,000			
60–80,000			
>80,000			
Parental education level (ref = college graduate)			
Did not graduate high school	1.00 (0.75–1.34)	0.92 (0.72–1.17)	0.92 (0.72–1.18)
High school or equivalent	0.90 (0.70–1.15)	0.87 (0.70–1.07)	0.78 (0.63–0.97)*
Some college or equivalent	0.98 (0.76–1.27)	1.09 (0.88–1.35)	1.07 (0.86–1.33)
Post-graduate professional	0.93 (0.66–1.30)	1.10 (0.84–1.45)	1.02 (0.77–1.36)
Generally healthy (self report)	1.27 (1.08–1.50)*	1.35 (1.17–1.56)*	1.72 (1.49–1.98)*
Frequently cries	–	–	–
Frequently feels fearful	0.87 (0.65–1.18)	1.29 (0.99–1.67)	1.13 (0.88–1.45)
Repeated a grade in school	–	–	–
Difficulty using hands and feet (self report)	0.80 (0.47–1.36)	1.55 (0.98–2.47)	1.24 (0.81–1.89)

CI confidence interval, AOR adjusted odds ratio; neighborhood contentedness and violent experience interaction tested for and not significant; physical activity defined as high ≥ 5 bouts per week, moderate = 3–4.5 bouts per week, low < 3 bouts per week

* $P < 0.05$

II OR = 1.11). This is important to note, because it allows us to see where the impact of discontent may reduce physical activity levels, which are important for adolescent health. The magnitude of the relationship was consistent between wave I and wave II of the study. Although the differences are slight, we can infer that neighborhood contentedness may be more impactful on the ability of the girls to move from a moderate level of physical activity to the optimal level.

In boys, the relationship was also significant and higher in boys than girls. This significant difference shows how much of a barrier to physical activity, uneasy neighborhood perception truly is. There is a possibility that some of

TABLE 5 Effect of neighborhood contentedness on physical activity goals in boys at wave II of the add health population

	Low to moderate physical activity AOR (95 % CI) (n = 1781)	Moderate to high physical activity AOR (95 % CI) (n = 5359)	Low to high physical activity AOR (95 % CI) (n = 5248)
Neighborhood contentedness	1.15 (1.07–1.23)*	1.09 (1.04–1.16)*	1.25 (1.18–1.33)*
Violent experience	1.21 (0.99–1.47)	1.16 (1.00–1.35)	1.40 (1.19–1.66)*
Age	0.86 (0.80–0.91)*	0.80 (0.77–0.84)*	0.69 (0.65–0.72)*
Race (ref. white)			
African American	1.46 (1.13–1.89)*	0.94 (0.78–1.13)	1.37 (1.10–1.70)*
Asian	1.64 (1.13–2.36)*	0.90 (0.69–1.18)	1.47 (1.07–2.01)*
Native American/Pacific Islander	0.76 (0.35–1.62)*	1.36 (0.72–2.57)	1.03 (0.58–1.85)
Other	1.24 (0.88–1.75)	1.03 (0.79–1.34)	1.28 (0.96–1.70)
Hispanic	–	–	–
English spoken at home	–	–	–
Parents married	–	–	–
BMI	1.05 (0.95–1.17)	1.10 (0.99–1.20)	1.15 (1.05–1.27)*
BMI ²	0.999 (0.997–1.00)	0.99 (0.99–1.00)	0.997 (0.996–0.999)*
Parental income (ref = 20–40,000 Annual)			
<20,000	1.03 (0.82–1.30)	1.28 (1.07–1.54)*	1.32 (1.09–1.61)*
40–60,000	1.02 (0.78–1.35)	1.33 (1.08–1.64)*	1.36 (1.08–1.70)*
60–80,000	0.92 (0.64–1.33)	1.54 (1.16–2.04)*	1.42 (1.06–1.90)*
>80,000	0.98 (0.66–1.46)	1.52 (1.13–2.05)*	1.49 (1.08–2.05)*
Parental education level (ref = college graduate)			
Did not graduate high school	–	–	–
High school or equivalent	–	–	–
Some college or equivalent	–	–	–
Post-graduate professional	–	–	–
Generally healthy (self report)	1.43 (1.67–1.74)*	1.66 (1.42–1.95)*	2.37 (2.01–2.80)*
Frequently cries	1.34 (0.46–3.93)	2.12 (1.01–4.49)*	2.85 (1.19–6.85)*
Frequently feels fearful	–	–	–
Repeated a grade in school	–	–	–
Difficulty using hands and feet (self report)	–	–	–

CI confidence interval, ORA adjusted odds ratio; neighborhood contentedness and violent experience interaction tested for and not significant; physical activity defined as high ≥ 5 bouts per week, moderate = 3–4.5 bouts per week, low < 3 bouts per week

*P < 0.05

these adolescents would choose to be more physically active, if they felt more content in their neighborhood. This may be an important barrier to physical activity and should be considered when promoting it to adolescents. Neighborhood level interventions that may make a community more open and familiar could promote this.

As noted, this is the first examination of the relationship between neighborhood contentedness and physical activity that we are aware of, although studies of neighborhood safety and physical activity have been conducted. One study by Bennett et al. looked at perceived neighborhood safety and self reported physical activity. When individuals reported their neighborhood as unsafe, they were less likely to report high levels of physical activity (OR for men 0.40, for women 0.68).² An additional study by Velasquez et al. showed that leisure time physical activity was significantly related to several perceived neighborhood safety factors in women. These include their perception of the neighborhood being very or somewhat pleasant and whether they considered their neighborhood to be extremely safe (OR = 1.70) or quite safe (OR = 1.75).²⁹ The effect of the magnitude in this study was larger than ours, but similar in its direction. In addition, women who felt that their neighbors could be trusted (OR = 1.35) were more likely to be involved with leisure time physical activity.²⁹ These gender differences are consistent with differences noted in our study. Gender should be considered when evaluating the relationship between PNC and physical activity. Boys and girls respond differently to neighborhood perceptions and participate in physical activity at different levels.^{6, 12, 17}

In a study by Humbert et al., focus groups conducted among high and low SES students were used to determine what they identified as barriers to physical activity. Safety was one cited by the authors, especially in low-income youths.¹⁵ The study showed that safety is of concern to adolescents, but that it may be more complex than just "safety" itself as other neighborhood constructs such as availability of and proximity to places conducive to physical activity. Our results agree with this assertion.

Although many studies have been conducted looking at aspects of perceived neighborhood contentedness and physical activity in adolescents, our study looked at this measure as a whole in a large nationally representative cohort of adolescents. We found that it may be a significant barrier to both boys and girls. The findings suggest that neighborhood contentedness should be considered when assessing barriers to physical activities in adolescents and that these barriers may be personalized. This is especially important because physical activity is a very good way for adolescents to maintain a healthy lifestyle and has been linked to reduced rates of adverse health indicators and disease development. In addition, activity patterns in adolescents have been shown to predict patterns in adults, so a healthy lifestyle is important to long-term health. This study has shown that neighborhood factors and contentedness are associated with and may be a potential barrier to physical activity. This indicates that it may be important to talk to adolescents to understand their personal feelings about the neighborhood and not rely solely on objective neighborhood level statistics when assessing this.

The finding that violent experiences were positively associated with physical activity levels was also interesting. We hypothesize that this may be a result of adolescents who are more physically active being outside in the neighborhood at greater rates and therefore have a larger exposure to violence. It may also be a result of people in the neighborhood who are exposed to more violence being more desensitized to it and not allowing it to stop them from taking part in physical activity. This relationship should be further evaluated in future studies.

It is important to understand what barriers to physical activity exist in a neighborhood. This research suggests that adolescent neighborhood contentedness should be considered when developing new interventions to increase physical activity. Community events, such as park openings or fitness days, should be promoted to increase the familiarity and trust

within the neighborhood. This may help to make adolescents feel more comfortable as well as make them more familiar with their neighbors, increasing their contentedness. It is helpful to build the infrastructure (ball fields, playgrounds, and sort courts), but integrating the community into these developments, as mentioned, may make these even more effective.

One limitation of this study is its time frame. The data was collected in the mid-1990s, and adolescent attitudes and perceptions have likely changed somewhat. Additionally, this is a cross-sectional study and therefore cannot infer causation. Further studies using methods such as a fixed effect panel model may be able to better elucidate the relationship.

The PNC measure that was used in this study can be implemented into other adolescent health studies. It incorporates more than just neighborhood safety or built neighborhood environment. It captures familiarity, safety, and comfort level. In addition, it may be used for future prospective studies as the Add Health study population ages. In addition, the relationship between PNC had any long-term effects on health indicators can be evaluated in the future. Presently, Add Health has collected two more waves of data and included common diseases such as diabetes and hypertension in the survey. Investigating the downstream health impacts of lowered PNC would be interesting and very informative to public health officials and should be considered in future research.

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