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Young Urban Adolescents' Activity Spaces, Close Peers, and the Risk of Cannabis Use: A Social-Spatial Longitudinal Analysis

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Abstract

Background: An understudied, yet important area of youth development research is the examination of how place affects critical psychosocial processes such as identity formation, problem solving, emotional regulation, and in particular with adolescents, belongingness, autonomy, social competency, and behavioral health. A growing spatially informed literature indicates that youth interact with meaningful places as environmental strategies, shaping developmental trajectories related to behavioral health.

Objectives: The objective is to investigate the relationship between place preference and health behavior among adolescents, with a focus on substance use behavior, specifically, cannabis use. We theorize that cannabis use is associated with place preference for urban, city types of places, and that this particular place preference interacts with close peer network behaviors.

Methods: To understand the role of preferred locations, close peer relations, and mental health on cannabis use, 248 adolescents (ages 13 to 14) were studied longitudinally. Logistic regression models tested the moderating effects of peer network health (sum of close friends risk and protective behaviors) on selecting city locations (urban stress/neighborhoods) as preferred places, and subsequent cannabis use.

Results: Results indicated that peer network health moderated the effects of choosing city locations as favorite, increasing the odds of cannabis use more than 8-fold at 24 months.

Conclusions: Favorite places located in city environments appear to interact with peer risk behaviors influencing the cannabis use of young urban adolescents, even after controlling for the influence of baseline cannabis use, neighborhood disorder the home neighborhood, age, gender, and mental health effects.

Keywords

cannabis use; young adolescents; activity place; emotional dysregulation; favorite place

An understudied, yet important area of youth development research is the examination of how place affects critical psychosocial processes such as identity formation (Hay, 1998;

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Twigger-Ross & Uzzell, 1996), problem solving (Kyle, Mowen, & Tarrant, 2004), emotional regulation (Korpela et al., 2002), and in particular with adolescents, belongingness (Lewicka, 2010), autonomy (Chatterjee, 2005), social competency (Hart, 1979; Smaldone, Harris, & Sanyal, 2008) and behavioral health (Mason, 2010). By examining the emotional attachment to place, this body of research indicates that youth interact with the everyday places they come in contact with in ways that influence their health (Cummins, Curtis, Deiz-Roux, & Macintyre, 2007). Place-oriented researchers have used the construct of activity space as a broad measure to understand the spatial dimensions and the social ecology of how place influences and interacts with individuals' lives. Activity space can be defined as an index that comprises all the locations that an individual has direct contact with as a result of his or her daily activities (Miller, 1991). Activity spaces are the manifestation of our spatial lives, representing the routine locations and all the accompanying psychological, social, and health-related experiences of these places (Golledge, 1997).

Multiple approaches to measuring activity space have been used to capture location data within a given time-frame such as travel diaries (Goodchild & Janelle 1984), structured interviews (Mason, Cheung, & Walker, 2004), and using location tracking technologies such as Global Positioning Systems (GPS) (Kwan, 2013; Mennis et al., 2016). This geographically informed research has shown that youth, and urban adolescents in particular, spend their time in a variety of spatially dispersed activity spaces that are not delimited by conventional geographic boundaries, such as census tracts, zip codes, political wards, or even home neighborhood (Browning & Soller, 2014). Research on activity spaces has suggested that the places a person frequents outside the home may expose him or her to a variety of psychological, social, and geographic factors that likely influence behavioral health issues that may not be observed when observations are limited to the home neighborhood (Mason et al., 2015; Mennis and Mason, 2011; Wong & Shaw, 2011; Zenk et al., 2011).

Place oriented research associated with human development is situated within a larger area of geographic inquiry referred to as place attachment. Place attachment integrates concepts related to people-place-bonding (Altman & Low, 1992) and may be defined as, "a positive affective bond between an individual and a specific place, the main characteristic of which is the tendency of the individual to maintain closeness to such a place" (Hidalgo & Hernandez, 2001, p. 274), and "a state of psychological well-being experienced by a person as a result of the mere presence, vicinity, or accessibility of the place" (Sharpe & Evert, 2000, p. 218). Place attachment can be understood through the examination of persons, places, and related psychological processes (Scannell & Gifford, 2010). The person dimension includes individual level psychological characteristics as well as the social bonds that are formed within these locations. The place dimension includes various geographic features and environments that occur over different spatial scales, such as specific buildings, neighborhoods, and cities an individual inhabits, and also includes the social component associated with each of these places. The related psychological processes can be described as conscious or unconscious enduring bonds to places, offering various forms of psychosocial benefits (Korpela, 2012).

Research indicates that positive place attachment has been found to increase a sense of security and belongingness (Giuliani, 2003), increase self-regulation and stress relief (Korpela, Kyatta, & Hartig, 2002), decrease perceived incivilities (drug dealing, gang activity) within one's neighborhood (Brown, Perkins, & Brown, 2003), and induce positive changes in mood states (Kerr & Tacon, 1999). Place attachment has been studied at the biological level with results indicating places can rapidly (within milliseconds) influence affect as measured through facial zygomatic muscle (relating to positive affect and smiling) (Dimberg, 1990; Hietanen, Klemettila, Kettunen, & Korpela, 2007), lower blood pressure, and increase cognitive performance (Paresons, et al., 1998). These findings suggest that through personal place-attachment to specific places, certain environments can have restorative effects on individuals at the conscious and unconscious levels, and that these effects are enduring (Korpela, 2012).

Recent research has attempted to understand the developmental mechanisms of place attachment through adapting developmental theory as a theoretical scaffolding. Building on Bowlby's attachment theory (1969), place researchers have begun to integrate place within the interactional processes of the developmental constructs attachment and affiliation. Morgan (2010) proposed a sequential developmental theory of place attachment predicated on Bowlby's research on secure human attachment. Initially, the child explores a physical place that induces fascination, mastery, adventure and sensory pleasure, leading the child away from the primary attachment figure. When interaction with the place produces pain or anxiety, the child is motivated to return to the attachment figure for regulation of emotional arousal, and to activate a positively affected sense of connection. After the child's needs for regulation and connection are satisfied, motivation for place attachment and the accompanying positive experiences drives the child back into the locations where this cycle continues with longer periods of self-regulation (Morgan, 2010). Continued exposure and interaction to a place where a child experiences the freedom to explore in a safe and secure setting produces positive, internalized psychological interactions such as exploration, mastery, sensory interactions and generates the affective bond known as place attachment.

In time, these important places can take on restorative qualities where self-regulation regularly occurs and thereby become favorite places. Korpela (1989) proposed an environmental self-regulation hypothesis associated with favorite place attachment. By extending the cognitive-experiential self-theory of Epstein (1985), Korpela posits individuals develop environmental strategies with favorite places to maximize pleasure through interacting with environments that enhance positive self-esteem, provide identity coherence, and in particular, regulate emotions (Korpela, 1989, 1992). Studies with adults and adolescents support the significance of favorite places in providing security, privacy, control, clearing one's mind, expressing troubles, self-reflection, problem solving, and respite from social demands (Abbot-Chapman & Roberson, 2001; Korpela, 1989; Mason et al., 2010; Mason & Korpela, 2009; Spencer & Woolley, 2000; Owens, 1994). Much of these outcomes can be situated within the field of study of emotion regulation, which incorporates coping, mood regulation, situation modification, attentional deployment, and cognitive change (Gross & Thompson, 2007). Thus, understanding the complexities of adolescent emotional regulation is important for those who work with youth, as research has established that

adolescents who struggle with emotional regulation are at increased risk for negative health outcomes, such as substance use (Simons & Carey, 2002).

As the child develops, place attachment typically evolves into an interaction between the physical and social domains, whereby specific domains of interaction with close peers and/or family occur at particular places, increasing the psychosocial meaning associated with those places (Smaldone et al., 2008; Korpela, 2012). These favorite places can then become a touchstone for mutual affection, security, loyalty, self-disclosure, friendship building, and identity development (Chatterjee, 2005). However, peers are also well known to contribute to risk behaviors such as tobacco, alcohol, and drug use (Bauman & Ennett, 1996; Haug, Núñez, Becker, Gmel, & Schaub, 2014; Knecht, Burk, Weesie, & Steglich, 2011; Light et al., 2013; Valente, Unger, & Johnson, 2005). Youth interact with their peers grounded in meaningful places, shaping their developmental trajectories related to risk behaviors (Mason 2010), underscoring the interactive nature of place and peers.

Strikingly, most peer relations research does not include place as a construct of interest, ignoring individuals' subjective meaning of places and the accompanying dynamic between place and peers. Peer relations are not aspatial, but rather are embedded within place, and in fact play an important role in creating adolescents' experiences of place through the social interactions that occur at particular locations. Indeed, an adolescent's perception of a place is closely tied to the people with whom the adolescent interacts and their attendant attitudes, values, and behaviors at various locations (Mason, 2010).

Nevertheless, not all activity spaces are healthy or emotionally restorative. The effects of particular types of activity spaces, set within neighborhoods characterized by high levels of disorder (as typified by the presence of vacant buildings, violent crime, unemployment, and poverty), have been implicated with a host of negative health outcomes. Healthful adolescent development may be compromised by risk-enhancing neighborhoods that can lead to substance use. In particular, the stress associated with spending time in these types of environments increases the risk for binge drinking, marijuana use and disorders (Copeland-Linder, Lambert, Chen, & Ialongo, 2011; Furr-Holden, et al., 2011; Lambert, Bradshaw, Cammack, & Ialongo, 2001; Mennis et al., 2016; Reboussin et al., 2015; Tucker, Pollard, de la Haye, Kennedy, & Green, 2013). Adolescents experiencing long-term environmental exposure to conditions of neighborhood disorder, such as living in public housing, violence, neighborhood dissatisfaction, and financial stress, are at increased risk for alcohol, marijuana, and cocaine use (Pabayo, Molnar, & Kawachi, 2014; Stogner & Gibson, 2013; Taylor, 2015).

Urban environments can also be considered stressful even under non-disordered conditions, where high visual and auditory stimuli (e.g. cars, people, noise) can result in fatigue to cognitive processing systems used for attentional focus (Kaplan, 1995; Ulrich et al., 1991). Indeed, research has found that city residents have a higher level of psychological stress as compared to those living in rural areas (Dhingra et al., 2009; Verheij et al., 2008). Exposure to natural environments, such as parks and other greenspace, can mitigate psychological stress by providing opportunities for physical activity and positive social interaction, as well

as by engendering physiological responses associated with attention restoration following stressful experiences (Bratman et al., 2015; Hartig et al., 2014; Sullivan, 2015).

In the present study, we aim to investigate the relationship between place preference and health behavior among adolescents, with a focus on substance use behavior, specifically, cannabis use. We theorize that cannabis use is associated with place preference for urban, city types of places, and that this particular place preference interacts with close peer network behaviors. Toward this end, 248 young urban adolescents (ages 13 to 14) were assessed for substance use, mental health, and activity space locations over 24 months to understand the interplay between adolescent development, favorite places, and cannabis use. We tested the longitudinal effects of city place preference on cannabis use, controlling for age, gender, residential neighborhood disorder, peer network health (sum of close friends' risky and protective behaviors), emotional dysregulation, and baseline cannabis use. We hypothesized that adolescents who preferred city locations (e.g. urban streets and neighborhoods) as their favorite place would be at increased risk for cannabis use as compared to those adolescents who preferred other places (e.g. parks, or the homes of friends or family). We also investigated the intersection of city place preference and peer influence, where we posit that peer network health moderates the effect of city place preference on cannabis use. We hypothesized that the association of city place preference with increased risk of cannabis use would be stronger for adolescents with risky peer networks. In other words, adolescents with risky peer networks and for whom city places are their favorite, are at particularly elevated risk for cannabis use.

Method

Participants

This study examined data from the Social-Spatial Adolescent Study, a two-year longitudinal investigation of the interacting effects of peer networks, urban environment, and substance use. Participants were recruited between November 2012 and February 2014. The majority of participants (72%, $N = 179$) were recruited from an urban adolescent medicine primary care clinic at Virginia Commonwealth University Medical Center, in Richmond Virginia; the remainder were recruited from a city health district satellite clinic, located within a subsidized housing development.

Eligible adolescents were age 13 or 14 at enrollment and a registered patient of either clinic site. Written informed consent was obtained from all parents and adolescent participants prior to conducting any research activities. The first author's university and the Richmond City Health Department's institutional review boards approved the research protocol, and the study received a federal Certificate of Confidentiality from the National Institutes of Health. Over 400 adolescents and parents were either approached at the outpatient hospital clinic or referred from the satellite clinic; of these, 57% enrolled in the study ($N=248$). Enrollment and data collection procedures were the same across sites. Chi-square tests revealed no significant differences in age, sex, or race of participants between the recruitment sites.

At enrollment, participants completed an initial survey in a private room separate from parents and any clinic staff. Participants received monetary incentives for their time and

effort in completing follow-up surveys (\$20 at 12-month and \$60 at 24-month). The majority of participants completed the follow-up surveys at 12 months (82%, $N = 203$) and 24 months (84%, $N = 208$). Subsequent independent t-tests revealed no significant differences between completers and non-completers on key variables (e.g., cannabis involvement, peer network health, $p > 0.05$).

Measures

Demographics.—Participants reported age, gender, race on the baseline survey. Gender was coded as 0 = female, 1 = male. Because the sample consisted of 88% African American, and because the remainder of the racial and ethnic groups were so small, we did not include race/ethnicity in our models.

Neighborhood Disorder.—Following previous research addressing the influence of neighborhood disorder on substance use and health (Dulin-Keita, Thind, Affuso, & Baskin, 2013; Reboussin, Green, Milam, Furr-Holden, Johnson, 2015; Ross and Mirowsky, 2001; Sampson, 2012), we used the U.S. Census Bureau and crime data to construct an index of neighborhood disorder incorporating commonly used indicators of community level poverty, violence, educational attainment, residential mobility, quality of housing infrastructure, and family composition. Using 2013 estimates (EASI, 2016) for the 103 block groups in the Richmond, Virginia metropolitan area that contain subject residences, the index was calculated as the mean of the z-scores of the following five variables (Cronbach's alpha = 0.84): percent living below the poverty line, percent single parent households, percent housing that is vacant, percent housing that is not owner occupied, and an index of the rate of criminal assaults. Block level address locations of all violent crimes (i.e. assault, robbery, rape, and homicide) and property crimes (e.g. burglary and theft) were geocoded and aggregated to the Census block group level to yield per capita violent crime and property crime rate variables. Thus, higher scores indicate a higher level of neighborhood disorder. Each participant was assigned a neighborhood disorder value based on the block group within which they resided at enrollment.

Peer Network Health.—Peer network health data were gathered using the Adolescent Social Network Assessment (ASNA; Mason, Cheung, & Walker, 2004). The ASNA captures information on each subject's close personal contacts, which constitute their personal or egocentric friend network. Because our study focused on the influence of close friend networks, we limited the number of nominated close friends to three as this is close to the national average of nominated friends (2.54; Ali et al., 2011). Adolescents were asked to think of up to three friends and to provide information about each of their friend's substance use, influence on behavior, and types of activities. Specifically, participants were asked eight questions about each friend: four about risk activities and four about pro-social activities. Risk items were about substance use, frequency of use, offers to use substances, and participating in illegal/dangerous activities. Prosocial items were receiving practical support (help with school, or transportation, emotional support (talking through problems), discourage substance use, prosocial activities involvement (school clubs, sports). These items create a total score for each peer and are based upon a weighted scoring procedure, with scores ranging from -14 to 14. Weights are based upon previous research that has

shown, for example, that risk for substance use increases with one substance user in a network, and risk for mental health problems is elevated with one daily substance user in a network (e.g., a three-fold increase; Mason et al., 2004). Given these data, we developed the following weighted scoring procedures: risk quality: substance user = -1, daily user = -3, negative activity = -4, influence to use = -6 and protective quality: non-substance user = 4, absence of negative activities = 4, influence not to use = 6. Each peer's score is summed. Assuming three peers per participant, total peer network health scores can range from -42 to 42. Higher scores indicate greater peer network health, and lower scores indicate increased peer network risk. For this study the ASNA had acceptable internal consistency (Cronbach's Alpha = .72). Because the ASNA was skewed right (positively) we used the median (19) to create a dichotomous variable to ease interpretation in the logistic regression models. Scores ranging from -27 to 18 were coded as 1 = risky peer network, and scores 19 to 42 were coded as 0 = non-risky peer network.

Emotional Dysregulation.—The Dysregulation Inventory (DI) was used to measure emotional dysregulation (Mezzich, et al., 2001). The DI is a 15-item scale that assesses a child's psychological dysregulation across multiple traits (affect, behavior, cognition). The aim of the DI is to characterize a dysregulation phenotype of substance use liability. Items are constructed as statements reflecting dysregulation (e.g., I have trouble controlling my temper) and participants were asked to rate whether said statements were never, occasionally, mostly, or always true for them. Summary scores were computed by summing a participant's responses. Higher scores reflected more emotional dysregulation. The DI had a favorable internal consistency (Cronbach's Alpha = .90).

Cannabis Use.—The Adolescent Alcohol and Drug Involvement Scale (AADIS, Moberg and Hahn, 1991) was used to measure cannabis use. The AADIS has excellent internal consistency (Cronbach's alpha 0.94) and is highly correlated with self-reported measures of substance use ($r = 0.72$), clinical assessments ($r = 0.75$), and subjects' perceptions of the severity of their own drug use problem ($r = 0.79$). For this study, the cannabis frequency item was used: Have often do you typically use marijuana?, which was coded as 0 = never used, 1 = tried but quit, 2 = several times a year, 3 = several times a month, 4 = weekends only, 5 = several times a week, 6 = daily, and 7 = several times a day. This item was recoded as 0 = never used, 1 = used.

Activity Space.—Activity Space was measured using the Ecological Interview (Mason, Cheung, & Walker, 2004) which produces a location-specific listing of an adolescent's weekly routine locations, as well as evaluations of these various locations. The Ecological Interview is based on an Environmental Indicators of Health Outcomes measure (Cheadle et al., 1992). Previous research with adolescents has produced accurate and valid geographic data, successfully identifying 90% of the collected geographic data (Mason et al., 2004). Participants were asked which of their routine locations is their favorite from a list based on previous research: City Places (mall, stores, restaurants, movies, city streets), friend's home, recreation/sports center, school, church/religious institution, park/river/nature, other.

Analytic Plan

The analysis began with descriptive statistics on all variables, producing means and standard deviations. Next, a Pearson correlation test examined the association between all pairs of variables. To test the hypothesis that adolescents who preferred city locations at baseline would be at increased risk for cannabis use, we compared those adolescents to those who preferred other, non-city places, testing three logistic regression models. First, baseline cannabis use served as the dependent variable and city place preference served as the independent variable. The city place variable was dichotomized into those who chose city places = 1, and those who chose other places = 0 as their favorite. All models controlled for age, gender, neighborhood disorder of the subject's home neighborhood, peer network health (sum of close friends risk and protective behaviors), and emotional dysregulation. Race was not used in the models as there was not enough sample variance in this variable (88% African American). We then included an interaction term peer network health x favorite place to determine the interactive effects of peers and place on cannabis use. We then repeated this analytical structure for the next two models using 12 and 24-month cannabis use as dependent variables respectively, while also including baseline cannabis use as a control variable, so that the model estimates the likelihood of transitioning from never having used cannabis to having used. All variables in each model used baseline data except for cannabis use, which included the 12 and 24-month variables. Missing data was handled using multiple imputation procedures (i.e., expectation maximization algorithm) in SPSS V. 24. Missingness for self-reported data ranged from 0 to 15%. A Little's MCAR test (Missing Completely At Random) was subsequently conducted ($\chi^2=3.140$, $DF=6$, $p>.05$), indicating no systematic missingness. All analyses were conducted using IBM SPSS Statistics, version 24.

Results

Table 1 provides correlations and descriptive statistics for all variables in the current study. All correlations were in the expected directions for key variables. The sample was 57% female, $N=141$, 88% African American, $N=218$, ($M_{age}=13.4$ years, age range: 13–14). Table 2 provides percentages and frequencies of selected activity spaces for the sample. As can be seen, city places was the most frequently preferred location for this sample. In examining these locations every six months for 24 months, city places remained the most popular.

Table 3 provides the results of the first logistic regression analysis with baseline cannabis use as the dependent variable producing two models. The first model shows that adolescents whose home neighborhoods are characterized by elevated levels of neighborhood disorder are more likely to use cannabis compared to adolescents living in less disordered neighborhoods (Adjusted Odds Ratio [AOR] = 1.77). Adolescents with elevated levels of emotional dysregulation and who had risky peer networks were also at increased risk for baseline cannabis use (AOR=1.10; AOR=3.73) respectively. Adolescents who chose city places as their favorite were not at increased risk for cannabis use compared to those who chose other locations. Model 2, which includes the interaction term City Place Favorite x Peer Network Health, shows that only neighborhood disorder emotional dysregulation

predicted cannabis use (AOR=1.84; AOR= 1.11) respectively. City place or peer network health risk did not predict cannabis use in this model.

We also analyzed the relationship between City Place Favorite and high and low disordered neighborhoods using a Chi-square goodness of fit test. We no found dependency between these variable, as adolescents choose city or non-city places as favorite regardless of the level of disorder in their neighborhoods, $\chi^2 (1, N = 248) = .153, p > .05$.

Table 4 shows the 12-month cannabis use results which now include baseline cannabis use. In model 1 baseline cannabis use was strongly associated with 12-month cannabis use with a five-fold increase in the risk (AOR=5.07). Age and City Place also predicted 12-month cannabis use (AOR=2.36; 2.96) respectively. In model 2, gender (being male) becomes significantly associated with 12-month cannabis use (AOR=2.29), and age and baseline cannabis use remain significant (AOR=2.33; 5.34) respectively.

Table 5 provides results for the 24-month cannabis use model. In model 1, age and City Place are predictors of cannabis use (AOR=2.72; 2.18) respectively. In model 2, age and baseline cannabis use are predictors (AOR=2.80; 8.28) respectively. Peer network health is significant and shows a protective effect; that is adolescents that have a less risky peer network are at reduced risk for 24-month cannabis use (AOR=.316). Finally, the interaction term city places x peer network risk is highly significant and very strong (AOR = 8.17), indicating that those adolescents who choose city places as their favorite place and have a risky peer network, have an eight-fold increase in cannabis use. Figure 1 illustrates the interactive relationship between peers and place on cannabis use. Those adolescents with risky peers whose favorite place is the city are much more likely to use cannabis at 24 months relative those with a more protective peer network, even accounting for city as favorite place (probability of .88).

Discussion

Results from this study contribute to literature regarding place attachment, highlighting the importance of favorite places as a psychological, social, and spatial mechanism associated with risk and protective behavioral outcomes. The current study involved young urban African American adolescents, thus expanding previous risk and protective place-based research to a relatively understudied population. By integrating psychological factors (emotional dysregulation), peer factors (peer network health), and place effects of the home neighborhood (neighborhood disorder), this study provides insight into the social ecological lives of urban youth and specifies particular types of activity space locations outside the home associated with increased cannabis use. Understanding the effects of preferred activity spaces and the accompanying peer influence on urban youth may provide opportunities to develop preventive interventions that leverage social-spatial risk factors unique for young adolescents.

These results also suggest a developmental component associated with favorite place, aligning with Morgan's (2010) theory of place attachment in children. At baseline, adolescents who chose city places as favorite were not at increased risk for cannabis use

relative to adolescents who chose other locations as favorite. However, at 12 and 24 months, the risk of cannabis use is associated with having city places as a preferred location. While home-based neighborhood disorder and emotional dysregulation were significant predictors of baseline cannabis use, these fall out of significance at 12 and 24 months. This may indicate that peers and preferred places become increasingly important, over mental health and home environmental factors. Notably, at 24 months the interactive effect of peers and place produced a large effect, signifying that as these adolescents age toward middle adolescence, there is an increased social-spatial risk for cannabis use.

This finding supports similar urban adolescent research examining the effects of interacting with high-risk peers in the presence of risk enhancing environmental settings. Mennis and Mason (2012) found that older adolescents were more strongly influenced by social and neighborhood contexts than younger adolescents, where ages 14–16 appear to be a key transition age for the emergence of contextual effects on substance use. One interpretation is that place attachment at age 13 or 14 represents a significant step toward a trajectory of future risk behavior through social-spatial interactions, and thus meets an unmet developmental need. These locations may be populated with adolescents involved in substance use, providing a draw for young adolescents seeking acceptance, stress relief, and identity formation (Korpela, 2012).

The question then arises, what is it about city locations that exert risk? Clearly, the complex dynamic of personality, social-economic factors, mental health, and peer/social influences, as well as the perceptions and interpretations of the built environment, must be considered. Choosing a specific city location as a favorite place and interacting with particular high-risk peers within this context provides the ingredients for risk enhancing activities. This social-spatial interaction may represent efforts to assist in identity development, and provide emotional regulation, and thus, can be understood as a key element in the development of behavioral health risks. For example, an adolescent may begin to affiliate with new, high-risk peers at a particular city location. This interaction between peers and place can begin to assist the adolescent in engaging in new behaviors such as cannabis use, while simultaneously formulating his or her identity that is now intertwined with these peers and place. The adolescent is now accepted into this small group which identifies with this location where cannabis use occurs.

Finally, there is an empirical question of access to cannabis by location. For example, do city places offer more access to cannabis or do friend's home? We are not able to fully answer these questions with our data, but these are important questions to understand the level of risk for adolescents at varying contexts. One interpretation is that because disordered neighborhoods have lower levels of social capital and parental monitoring, these characteristics provide more risk-enhancing opportunities for adolescents to engage in substance use behavior.

There are several study limitations to consider when interpreting these results. First, our sample was an urban, primarily young African American sample and therefore our findings may not apply to other populations. Replications with more diverse ethnic and geographic populations are needed. In addition, our sample was drawn from an adolescent health clinic,

and thus, may not generalize to non-primary care samples. Second, we limited our friend network measure to collect data on each participant's three closest friends. While this is in line with data on the average number of nominated close friends among adolescents (Ali et al., 2011) and relevant to our hypotheses, findings may differ for a more expanded inclusion of friendships. Future studies could examine more extensive friend networks to determine if these findings vary with the size of an adolescent's friend network. Another limitation is that we did not track individual trajectories over-time, but instead used multiple cross sections of the sample at different ages over two years. Future studies could examine alternative analyses to test for differences in these results. The outcome measure AADIS includes an item that is potentially problematic: tried but quit. We placed these participants into the use group in our models. We also ran models with these individuals coded as 0, and got the same results, increasing our confidence in our results. Finally, a low recruitment response rate might have contributed to our sample's limited generalizability. Many families decided not to participate because of time constraints or lack of resources such as (e.g., limited transportation to return for enrollment appointment, lack of childcare for other children). Thus, our sample may be less representative of families experiencing higher demands or stresses on their time.

The results from this study support our two hypotheses: (1) preference for city places is associated with increased cannabis use, and (2), this increased cannabis use is stronger for adolescents with more risky peer networks. In sum, young urban adolescents with risky peer networks and for whom city places are their favorite, are at particularly elevated risk for cannabis use. These results provide evidence of the importance of considering the socio-spatial dimensions of the lives of young urban adolescents when addressing cannabis use, and in particular place attachment. Favorite places located in city environments appear to interact with peer risk behaviors to influence in the cannabis use of young urban adolescents, even after controlling for the influence of baseline cannabis use, neighborhood disorder the home neighborhood, age, gender, and mental health effects. A unique contribution of the current study is the developmental implications through the longitudinal nature of these data. Applied research that can incorporate such findings has the opportunity to test innovative and potentially meaningful intervention models that address social-spatial risk factors among urban youth. While these results appear promising, more work is necessary to understand the intersection of place, peers, and mental health on youth substance use and other behavioral health outcomes.

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Figure 1.
The Moderating Effects of Peer Network Risk on City Locations as Favorite Place at 24-months.

Table 1.

Descriptive Statistics and Correlations among Variables. All Variables are Measured at Baseline, except for Cannabis Use where time-points are indicated. (n=245)

	1	2	3	4	5	6	7	8	M (SD)	N (%)
1. Age	–								13.4 (.49)	
2. Female	.05	–								140 (57)
3. Cannabis Use Baseline	.06	.17 **	–							28 (11.4)
4. Neighborhood Disorder	–.09	–.04	.03	–					.52 (.85)	
5. Emotional Dysregulation	–.08	–.10	–.23 **	–.02	–				13.7 (9.3)	
6. Peer Network Health						–				129 (52)
7. (protective)	–.18 **	–.16 *	–.24 **	–.02	–.07					
8. City Places as Favorite	–.07	–.09	.01	.05	.05	.10	–			78 (31.5)
9. Cannabis Use 12 months	.14 *	.16 *	.34 **	.01	.01	–.17 *	.12	–		54 (21.8)
10. Cannabis Use 24 months	.17 *	.08	.35 **	.09	.18 *	–.17 *	.12	.47 **		74 (30)

*
 $p < 0.05$

**
 $p < 0.01$

Table 2.

Favorite Places Beyond Participants Homes (baseline, (n=245))

Favorite Place	Percent	N
City places: mall, stores, restaurants, movies, city streets	32.8	78
Friends home	24.4	58
Recreation/sports center	14.3	34
School	12.2	29
Other	9.2	22
Church/religious institution	4.2	10
Park/river, nature	2.9	7

Table 3.

Adjusted Odds Ratios and 95% CI of Risk of Cannabis Use at Baseline (n=245)

	Model 1			Model 2		
	AOR	95% L.C.I	95% U.C.I.	AOR	95% L.C.I	95% U.C.I.
Age	2.35	.959	5.78	2.48	.993	6.18
Gender	2.25	.908	5.57	2.30	.926	5.74
Neighborhood Disorder	1.77 *	1.01	3.09	1.84 *	1.04	3.26
Emotional Dysregulation	1.10 **	1.01	1.15	1.11 **	1.05	1.16
Peer Network Risk	3.73 **	1.37	10.16	2.41	.788	7.38
City Place Favorite	.800	.300	2.13	.200	.023	2.20
City Place Favorite X Peer Network Risk				5.419	.423	69.42

*
= p<.05**
=p <.01; AOR= adjusted odds ratio

Table 4.

Adjusted Odds Ratios and 95% CI of Risk of Cannabis Use at 12-Months (n=192)

	Model 1			Model 2		
	AOR	95% L.C.I	95% U.C.I.	AOR	95% L.C.I	95% U.C.I.
Age	2.36 *	1.09	5.10	2.33 *	1.07	5.07
Gender	2.07	.943	4.56	2.29 *	1.02	5.11
Neighborhood Disorder	1.00	.642	1.56	.970	.616	1.52
Emotional Dysregulation	.984	.941	1.03	.982	.938	1.02
Baseline Cannabis Use	5.07 **	1.99	12.91	5.34 **	2.09	13.65
Peer Network Risk	1.02	.471	2.24	.582	.216	1.56
City Place Favorite	2.96 **	1.30	6.71	1.50	.499	4.55
City Place Favorite X Peer Network Risk				4.49	.896	22.59

* = p<05

** =p <.01; AOR= adjusted odds ratio

Table 5.

Adjusted Odds Ratios and 95% CI of Risk of Cannabis Use at 24-Months & Conditional Effects (n=205)

	Model 1			Model 2		
	AOR	95% L.C.I	95% U.C.I.	AOR	95% L.C.I	95% U.C.I.
Age	2.72 **	1.35	5.48	2.80 **	1.37	5.72
Gender	1.71	.846	3.45	1.93	.936	4.00
Neighborhood Disorder	1.41	.935	2.14	1.38	.902	2.13
Emotional Dysregulation	1.03	.992	1.07	1.03	.991	1.07
Baseline Cannabis Use	7.87	2.25	27.53	8.28 **	2.41	28.45
Peer Network Risk	.715	.353	1.44	.316 *	.125	.796
City Place Favorite	2.18 *	1.07	4.42	.882	.339	2.29
City Place Favorite X Peer Network Risk				8.17 **	1.91	35.02

*
= p<05**
=p <.01

AOR= adjusted odds ratio

Conditional effect of City Place on Cannabis Use at values of the moderator:

Peer Network Risk	Effect	se	t	p	LLCI	ULCI
-.5122	-.1857	.2875	-.6459	.5191	-.7526	.3813
.4878	.7849	.3176	2.4713	.0143	.1585	1.4114