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“It just depends on the environment”: Patterns and decisions of substance use and co-use by adolescents

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Abstract

This study used rich qualitative data to examine the role that social and physical contexts play in decision-making related to simultaneous use of alcohol and marijuana among adolescents. In-depth, semi-structured interviews were conducted with 13 adolescents who used alcohol and marijuana within several hours of each other. Decisions about whether to use alcohol and marijuana simultaneously as well as use patterns (e.g. the sequence in which substances were used) were informed by the context and the desired effect of the substance(s). Also, simultaneous alcohol and marijuana use was described as occurring in multiple contexts, both destination and transitional. Interventions designed to reduce simultaneous alcohol and marijuana use could benefit from paying attention to substance use contexts.

Keywords

substance simultaneous use; adolescents; qualitative

Adolescent substance use is a continuing problem in the United States, with approximately 33% of 12th graders using alcohol and 22.5% using marijuana in the past month (Johnston, O'Malley, Miech, Bachman, & Schulenberg, 2017). Moreover, approximately 16–36% of adolescents report using multiple substances within the past month (Connell, Gilreath, & Hansen, 2009; Gilreath et al., 2013). Simultaneous use is the use of two or more substances within a few hours (Lipperman-Kreda, Gruenewald, Grube, & Bersamin, 2017). Simultaneous substance use in adolescence is related to a range of negative outcomes, including using greater quantities, higher risk of externalizing problems, depressive symptoms, victimization, psychological distress, dropping out of school, and violence (Baggio, Studer, Mohler-Kuo, Daeppen, & Gmel, 2014; Baskin-Sommers & Sommers, 2006; Chun et al., 2010; Conway et al., 2013; Kelly, Chan, Mason, & Williams, 2015; Kelly, Evans-Whipp, et al., 2015; Parker & Bradshaw, 2015). Alcohol and marijuana are the most commonly used substances by adolescents (Johnston et al., 2017). Since simultaneous use of

alcohol and marijuana could lead to future use of other illicit drugs and it is related to binge-drinking and externalizing problems (Lippman-Kreda, Gruenewald, Grube, & Bersamin, 2017; Baggio et al., 2014; Chun et al., 2010), understanding the decisions adolescents make regarding whether, when, and where to use alcohol and marijuana simultaneously could help prevent related problems.

Initial work examining decision making around youth drug use (Parker, Aldridge, & Meashem, 1998) and marijuana use (Shukla & Kelly, 2007) has not focused extensively on the role of context in these decisions or on simultaneous use. However, some theorists have emphasized the importance of contexts in decision-making related to drug use. Zinberg (1986) argues that substance use decision-making is related to three factors: 1) the drug itself (i.e. physiological effects of the drug on the user); 2) the set (i.e. characteristics of the individual including personality); and 3) the setting (i.e. the physical and social context in which the substance will be used). This theoretical framework suggests that considering both the expected physiological effects of drugs and contexts of drug use is important to understand adolescents' decision-making related to simultaneous alcohol and marijuana use.

More recent work has also emphasized the importance of drug use contexts. The social ecological model of drinking contexts and alcohol-related problems posits that drinking contexts are related to alcohol consumption and related risks (Freisthler, Lippman-Kreda, Bersamin, & Gruenewald, 2014). In this model, drinking contexts are conceptualized as having three dimensions: social characteristics, physical characteristics, and situational characteristics. *Social characteristics* refer to the number and type of social contacts that are present in the context. *Physical characteristics* include the location (i.e. park, home) as well as characteristics of the location (i.e. remoteness). Finally, the *situational characteristics* of a substance use context are changeable factors such as the presence of parental monitoring and the time of day (Freisthler, Lippman-Kreda, Bersamin, & Gruenewald, 2014). Limited research has shown that where adolescents drink, as well as the social and situational characteristics of that setting, are associated with drinking rates, problems, and use of alcohol and other substances (Bersamin, Lippman-Kreda, Mair, Grube, & Gruenewald, 2016; Jackson et al., 2016; Lippman-Kreda, Gruenewald, Bersamin, Mair, & Grube, 2017; Lippman-Kreda, Gruenewald, et al., 2017; Lippman-Kreda, Mair, Bersamin, Gruenewald, & Grube, 2015; Mair, Lippman-Kreda, Gruenewald, Bersamin, & Grube, 2015; McCabe, West, Veliz, Frank, & Boyd, 2014). In this paper, we extend this model to consider decisions surrounding simultaneous use of alcohol and marijuana, arguing that these decisions may differ by context.

Taken together, theories and previous research suggest that contexts are important for adolescents' substance use behaviors and could be a potential touchpoint for place-based interventions to reduce adolescent substance use and negative sequelae. However, we know little about whether and how adolescents perceive contexts as being related to simultaneous use of alcohol and marijuana. It could be that adolescents plan to simultaneously use substances in specific contexts based on characteristics of those contexts (e.g. privacy, security, activities), create specific contexts to allow simultaneous alcohol or marijuana use, or use it more spontaneously in particular contexts where they can. Qualitative interviews, which are designed to elicit rich detail about phenomena, are well suited to investigate how

adolescents make decision about whether and where to use alcohol and marijuana simultaneously. This exploratory study used in-depth qualitative interviews with 13 adolescents (16–19 years old) from mid-sized cities in California to examine adolescents' decision-making and context-specific patterns of simultaneous alcohol and marijuana use.

Method

Participants

Study participants were recruited from a sample of 154 youths from 12 mid-sized California cities who participated in a larger study on adolescent substance use behaviors using Ecological Momentary Assessment (Lipperman-Kreda, Grunewald, et al., 2017). Participants of the original study completed 12 brief text-based surveys assessing the quantity and context of substance use behaviors. For the current exploratory study, the study authors purposively sampled from participants who reported use of alcohol and another substance within 3 hours during at least one weekend of data collection (n=31 eligible youth). As simultaneous use of alcohol and marijuana was reported in all cases and was the most common type of simultaneous use, our analyses focused on this combination. Due to budget constraints, the initial target sample was approximately 12–15 youth; recruitment ceased when theoretical saturation had been achieved within that range. Thirteen youth participated in this qualitative study. Participants in the sample were all White, non-Hispanic, majority male (61.5%), and ranged in age from 16–19. The average highest reported education for either parent was 17 years (i.e., college graduate), and the average amount of weekly spending money reported by participants (excluding money that is given to spend only on things like bus fare or lunch) was \$43.00 (range \$15.00–100.00). All but one of those participants were enrolled in high school or a post-secondary institution at the time of the interviews.

Procedures

The Pacific Institute for Research and Evaluation (PIRE) institutional review board (Federal-wide Assurance #FWA00003078) approved the study prior to implementation. We obtained verbal or written permission from a parental guardian prior to contacting all eligible youth. Youth who consented to participate in the study were scheduled for an approximately one-hour interview at a time that was convenient for them. The original protocol called for in-person interviews (n=9) in the local geographic region. However, due to low numbers of adolescents meeting the study criteria (i.e. simultaneous use of alcohol and another substance in the EMA data collection), we expanded our data collection efforts to include telephone interviews (n=4) with youth who lived in farther geographic areas. Previous studies that examined differences between qualitative data collected via semi-structured in-person interviews and qualitative data collected via telephone interviews found few or no differences in the quantity and depth of question responses (Sturges & Hanrahan, 2004; Vogl, 2013).

The interviews began with a pile-sorting exercise in which youth were asked to categorize and discuss different contexts where youth may use or simultaneously use substances (e.g. house party, park). This exercise was used to stimulate conversation about the contexts in

which youth used and simultaneously used substances. Then, youth were asked to describe a typical night during which they would use a drug or tobacco before, after, or while using alcohol. The results reported here refer to the simultaneous use of alcohol and marijuana. Follow-up probes were used to extract rich details, focusing on the environmental, social, and situational characteristics of simultaneous use contexts. The study interviewer was attuned to the verbal cues elicited in telephone interviews (e.g. sighs, longer pauses) that signal opportunities for probing (Sturges & Hanrahan, 2004). The interviews were digitally recorded and professionally transcribed. Transcripts of in-person interviews and telephone interviews were compared and revealed no notable differences in the quantity and depth of responses, but it is unknown how interviews with individual youth would have differed if they had been interviewed by the other method (e.g. phone vs. in-person).

The study interviewer coded data into analytically manageable segments (i.e. codes) with the use of Atlas.ti software, version 7. The definition of contexts as having social, physical, and situational characteristics (Freisthler et al., 2014) was used as a sensitizing concept for the analysis (Bowen, 2006). However, the analysis was primarily inductive, focusing on generating theory from the data itself (Creswell & Miller, 2000). Simultaneous use of alcohol and marijuana was defined as using both substances in the course of a day or evening, in close enough succession that it would be possible to experience joint physical effects. Use of marijuana with a medical recommendation was included, as youth described this use as recreational.

Approximately 40 codes were developed by the study authors to investigate patterns and emerging themes in the data (Braun & Clarke, 2006). Examples of codes include “party atmosphere”, which was used when youth described decisions to use or simultaneously use substances based on whether the context felt like a party, and “maintaining control”, which was used when youth described contexts and circumstances where they did not want to become intoxicated. The first author met with the other study authors regularly to read through and discuss interview transcripts and to develop a codebook. As the codebook developed, the first author would return to previously coded transcripts to apply new codes. Towards the end of data collection, the first author used member checks (i.e. discussions of initial findings with study participants) to ascertain the face validity of the developing codebook (Creswell & Miller, 2000). Data collection ceased after several new interviews failed to generate new codes surrounding the study research questions, indicating theoretical saturation (Creswell & Miller, 2000). The final codes were then used to develop a thematic structure for the analysis. The findings presented here relate specifically to adolescents’ decision-making about whether and where to use alcohol and marijuana simultaneously.

Findings

We identified three themes from the data: 1) context characteristics inform decisions about simultaneous use; 2) contexts characteristics determine simultaneous use patterns; and 3) simultaneous alcohol and marijuana use occurred in both destination contexts (i.e., a context in which a significant amount of time was spent) and transitional contexts (i.e. contexts that they were moving through on their way to somewhere else, such as a park or car).

Context Characteristics Inform Decisions about Simultaneous Use

Adolescents described making decisions about which substance to use (including whether or not to use alcohol and marijuana simultaneously) based on how the physiological effects of the substance would fit with the social, physical, and situational characteristics of the context. Even though all of the respondents were simultaneous users of alcohol and marijuana, in some instances they chose to use one substance and not the other. This decision was related to how they wanted to feel or behave in a particular event and whether they thought the use of one substance or both would help facilitate this feeling or behavior. The desired feelings or behaviors were in turn shaped by characteristics of the context, such as the size of peer group present or whether there was active monitoring by authority figures.

Specifically, marijuana was noted repeatedly as a substance that could be used in situations during which youth had to maintain control or where they were likely to encounter authority figures. The effect of marijuana use, described as a “high” of pleasurable calm or a heightened sense of being, was consequently seen as a good fit for contexts where youth had to engage with adults or where obvious intoxication would not be appropriate. A youth described,

“Well, I just feel like most people like being high more than they do being sober. So maybe in a way, it would enhance the [sport event]. Because, I don’t know, people usually get high because they like the way it enhances everything... *[Of country clubs, school events, and malls]* I would only smoke weed there, because the only substance I feel where I can fully act like myself and not be obvious would be weed. ‘Cause if it’s public, you know. Restaurant, same thing. I wouldn’t go drunk to a restaurant, but I would go high.”

(Participant 5, Male, age 17).

This participant notes that he made conscious decisions not to use alcohol and marijuana simultaneously at sporting events, country clubs, and school events, because the addition of alcohol would alter his behavior too drastically and potentially make his substance use more identifiable to adults. His decision to use only marijuana in these contexts was thus based on their social (e.g. number of surrounding people), physical (e.g. public setting), and situational (e.g. adult monitoring) characteristics.

Some youth also preferred to use only alcohol in particular contexts, rather than using alcohol and marijuana simultaneously. These decisions were also informed by how the desired consequences of alcohol use aligned with the characteristics of the context where they were using. For alcohol, the desired effects were generally described as lowered inhibitions and enhanced sociability, which were desired in larger party settings. In addition, youth believed that the effects of alcohol were more difficult to mask than those of marijuana, and consequently chose to use alcohol in contexts where they were less likely to interact with adults, such as parties where no adults were present. One respondent who primarily smoked marijuana noted that alcohol was a “special occasion” substance for her, and she chose to only drink when at larger house parties. She notes,

“You wanna mingle when you’re drinking.

Interviewer: Tell me more about that. If you're going to be drinking, what kind of environment do you want to be in?

Like a more social one, where I can walk around and talk to different people. I usually don't drink if it's just me and one other person. It's usually a party or a little get-together. It's more like an event than just like, 'Hey, let's smoke [marijuana] real quick and then go to bed.' It's two completely different types of things."

(Participant 12, Female, age 18).

Of the social characteristics of a context, the number of people at an event was perceived as important in evaluating which substances to use. Respondents noted that the size of the group was a key factor in determining whether it was a "party" (and thus ideal for drinking), or a "kickback" (which were more casual get-togethers of close friends described as best for marijuana use). For example,

"I think it's just like you get the vibe more of... like, it's just more common to smoke weed when you're at a small kickback than at a huge party. Huge parties are more reserved for alcohol. You don't go to a party with 70, 80 people and everyone's smoking weed. I don't know. That kind of party doesn't really happen here. So you don't really see a lot of that...I think that the mood that weed gives you is more suited for a smaller group than a gigantic party where everyone is dancing and yelling and going crazy. That's kinda more what you want alcohol for."

(Participant 10, Female, age 18).

In addition to the size of the group, other social characteristics of contexts that influenced decisions about whether to use substances simultaneously included the behaviors of those surrounding them. Adolescents described being more likely to use alcohol or marijuana simultaneously when those around them were also using those substances. One adolescent, who generally limited his substance use because of his involvement in high school sports, noted,

"It's more fun to be around other drunk people if you're drunk too. Like, if you're the only drunk one and everyone else is sober, you'd probably just not have as much fun, 'cause you can't act drunk I guess. But if you're at a party and everyone's drunk, it's more fun if you're drunk."

(Participant 3, Male, age 17)

These findings indicate that decisions about whether to use alcohol and marijuana simultaneously or individually were influenced by how the social, physical, and situational characteristics of the context, including the number of people around them, the use behaviors of those people, the type of activity there (e.g. dancing or conversation), and the presence of adults or security, interacted with the perceived effects of the drug.

Context Characteristics Determine Simultaneous Use Patterns

The patterns (e.g. the sequence of simultaneous alcohol and marijuana use) and temporal sequences (e.g. used at the same exact time or with spacing between the two) of simultaneous alcohol and marijuana use were also described as influenced by context characteristics. For example, one adolescent male described following the same simultaneous use pattern and sequencing whenever he attended a large party and used the term “formula” in his description,

“Generally, the formula that I kind of go with is there will usually be a pregame. I’ll have a couple of shots of something. Usually it’s whatever we have on hand, if it’s vodka or if it’s whiskey. Then we’ll walk to the party... Usually at the party, I’ll drink mostly hard alcohol, ‘cause that’s what there is. Then kind of as the night winds down, maybe if there’s beer, I’ll drink that... Then usually, at the end of the night, me and my friends will smoke [marijuana], because it helps kind of wind down and it’s supposed to make the hangover less bad.”

(Participant 8, Male, age 18)

In this quote, the respondent describes how decisions about when to drink alcohol and smoke marijuana are informed by a sequence of desired effects (i.e. sociability at larger parties, “wind down” at the end of the evening). This pattern had been established based on his previous experiences with simultaneous alcohol and marijuana use. He notes, “I used to drink a lot of hard alcohol and a lot of beer and just anything I could get my hands on. And my stomach kinda later on, through the year was like, ‘This isn’t really working’. So now I’m a lot softer on myself than I used to.” Being “softer” on himself meant drinking less overall and transitioning from hard alcohol to beer and finally to marijuana as the evening progressed. However, this specific pattern only applied to large parties, as he discussed not following a specific pattern in other contexts.

“If I’m just hanging out with my friends, then it’ll be kind of interspersed. You know, we’ll smoke, we’ll drink, we’ll smoke, we’ll drink. So if there’s a party, there’s a lot more kind of order in that I know what I wanna consume from this, because I’m better at socializing and talking to people when I’m just drinking. But if I’m just hanging out with my very close friends, then I’ll do whatever because then I’m comfortable. No matter what, I’m on.”

(Participant 8, Male, age 18)

For this youth, the social characteristics of the context, particularly the number of people present and the degree to which he knew them influenced his alcohol and marijuana simultaneous use patterns. Other respondents shared similar use patterns for large party contexts, which were developed based on past experiences.

“I’m probably less likely to smoke [marijuana] if it’s a big group, just ‘cause most people that are smoking aren’t as... don’t wanna smoke you out I guess if it’s a big group. ‘Cause they’re probably smoking with like their close friend who also bought the weed, ‘cause they don’t want a ton of people coming over that can go get some. So it’s just more closed off. They might go around the side yard or whatever. But at smaller parties, like 20 people, they’ll just smoke inside if the

person's okay with it, or in the backyard if it was open. I'll smoke there, because I'll just sit down and they'll offer me it. And at those smaller parties, we're all friends. Not close friends, but we're all friends with each other, know each other, and like each other. ...But we're all mutual friends that can hang out, whereas at a bigger party, there's random people that you don't know or don't like and stuff."

(Participant 3, Male, age 17)

At smaller house parties, the social characteristics of the context, including how well he knew the individuals present, influenced the respondent's decision to simultaneously use alcohol and marijuana. Like other respondents, this youth noted that he followed a specific pattern by generally using alcohol first, followed by marijuana at smaller house parties.

"I always drink first. 'Cause if I smoked [marijuana] first, then I wouldn't wanna drink probably. If I were to drink beer high, it's just like disgusting. And I would just be high and fine with it; I wouldn't need to get drunk. If I'm high, I'm just like I guess in my own world. I'm not thinking about getting drunk or being social I guess."

(Participant 3, Male, age 17)

Overall, patterns of simultaneous alcohol and marijuana use varied by context. Alcohol and marijuana simultaneous use was described as most typical at large parties (e.g. 25 people or more). In addition, house parties, both large and small, were described as having more rigid patterns than other contexts.

Destination and Transitional Contexts of Simultaneous Use

Adolescents described simultaneous alcohol and marijuana use in two types of contexts: destination and transitional. Destination contexts were places where adolescents stayed for a longer period of time. These contexts were usually the youth's intended destination for the evening (e.g. a house party or a concert). For example, one adolescent reported that he generally used alcohol and marijuana simultaneously only at his own house (in a backyard treehouse) or at a friend's house. Here he describes his most typical pattern (which on occasion included alcohol as well),

"I guess if we're at my house, then I would stay out in our tree house with my friends. Or if I was at a friend's house... one of my friends, we'd hang out in his garage. One of my other friends, we'd stay in his room. We'll usually just hang out, like five or six or seven of us, and then smoke [marijuana] and listen to music. Or we'll have video games set up in the tree house, so sometimes we'll play video games. Usually, we just hang out by ourselves and listen to music and have conversations."

(Participant 2, Male, age 17)

This description was atypical, however, as most adolescents described long evenings of simultaneous alcohol and marijuana use that involved use in several different contexts, including transitional contexts. Transitional contexts were places that adolescents were in for short amounts of time, generally in the process of reaching a different destination. Transitional contexts consequently included cars, parking lots, or streets. Youth often

described using in several different transitional contexts during the course of an evening. While simultaneous use of alcohol and marijuana would occur over the course of the evening, the frequent moving of adolescents between transitional contexts meant that sometimes only one substance would be used in each context. For example, one young female described a recent night out with friends,

“We went to my house, and there was like ten of us, nine of us. We drank in my room. Then we walked out. We walked over the bridge. It’s like only a five- or ten-minute walk. Drank on the way, like in little places where it was safe to. We would stop and drink. I mean, we were smoking [marijuana and cigarettes] as we were walking too. Then we would stop and pour alcohol into like a collapsible flask that we could hide and bring into the show, and then ditch whatever was left in the bottle. Usually, there wasn’t anything left. I don’t know. It always varies. A lot of times, then we stop at [a restaurant], which is right next to [a dance club], and just sit in there and drink if we’re gonna wait a little bit longer for the show to start or if we didn’t drink more. And then we’d go inside and wait ‘til the show ends. And almost always, we walk back.”

(Participant 13, Female, age 16)

As in the above quote, youth reported using alcohol and marijuana simultaneously in transitional contexts to avoid detection as well as to enhance their fun. However, because some of the contexts were transitional and youth were moving quickly through them, they often were using one substance at a time. For some youth, simultaneous alcohol and marijuana use events were composed primarily of transitional contexts, as they moved continuously through the evening until they found something to do.

“Just a typical night, we’d maybe be driving around. Have someone who’s the designated driver. If it’s like a Friday night, sometimes we’ll just go get alcohol no matter what. So even if nothing’s going on, you can have something to do by drinking the alcohol wherever you are with your friends. But a typical night, probably... like yeah, we drive around. We wait ‘til we find out what’s going on, get the alcohol, go to the event with the alcohol, just drink it there, have fun, and then either sleep there or go home at 12:00 or whenever it ends.”

(Participant 5, Male, age 17)

This youth would generally end his evening by smoking marijuana. Use of transitional contexts for alcohol and marijuana use and simultaneous use was particularly salient for younger adolescents, who did not have their own housing where they could use substances without adult supervision and described more intense parental monitoring. The use of transitional contexts was consequently a way to use or simultaneously use alcohol and marijuana in contexts where less monitoring was present, such as parks or streets at night.

Older adolescents also reported using in transitional contexts, particularly when “pre-gaming” or using substances before they arrived at their intended destination context. Pre-gaming, which allows adolescents to arrive at a party or other destination already under the influence of substances, was typically described as involving a smaller group of friends.

“So probably, I would say I usually pregame about two to three shots, and then do two to three more drinks when I get there...If I’m walking, then I’ll pregame at my house. If I was driving, then I’ll pregame in a car. Kinda wherever. Like, driving right after I drink kind of gives me a little bit of car sickness, so I usually try to avoid that.”

(Participant 10, Female, age 18).

By using in a transitional context before arriving at their final destination, youth were able to time their use so that they were experiencing intoxicating effects right when they arrived at a party or event. In addition, youth were also able to ensure that they used their desired amount of substances, and thus did not have to worry whether a house party would have alcohol or marijuana for them to use. The use of transitional and destination contexts was seen in all of the youth that were interviewed, with most youth using substances in at least one transitional context every time they used substances simultaneously.

Discussion

In this exploratory study, we used in-depth qualitative data to examine decision-making and context-specific patterns related to simultaneous use of alcohol and marijuana among adolescents who reported using both substances during a three-hour period. These themes provide an initial glimpse into how the decisions and patterns of simultaneous alcohol and marijuana use are related to social, physical, and situational contexts.

As theorized by the social-ecological model of drinking contexts and Zinberg’s (1986) drug, set, setting framework, our findings support earlier research suggesting that youth substance use behaviors are associated with contexts (Bersamin et al., 2016; Lipperman-Kreda et al., 2015). Youth who use alcohol and marijuana simultaneously reported “matching” a substance or substances to their context. Thus, while all the youth in our sample used both alcohol and marijuana, they did not use both on every occasion and in every context. Instead, they chose to base their simultaneous substance use on different characteristics of the context, which included both physical elements, such as privacy and safety, and social or situational aspects, including the size of group, the substance use behaviors of their peers, and the presence or absence of adult monitoring. These context characteristics were then considered in light of perceptions about how using a particular substance would make them act or feel. For these reasons, youth in our sample often reported marijuana use as better for more public contexts, such as a sporting event. This stemmed from beliefs that the effects of marijuana were not strong enough to dramatically alter their behavior and could thus be hidden from parents or authority figures. In contrast, alcohol was viewed as better for private, party-like contexts (where adolescents desired greater sociability and could “act drunk”). Although these findings are not generalizable to other populations, they offer initial indications that research and interventions surrounding simultaneous use of alcohol and marijuana among youth might benefit from attention to the characteristics of contexts. Context-based interventions might then consider substance use-context “matching” by targeting the substances that youth are more likely to use or simultaneously use at specific contexts. For example, home-based interventions could help parents to identify risky

situations for substance use and simultaneous use signs of “pre-gaming” and common ways that substances are smuggled in and out of the home by youth.

Our findings also suggest that more nuanced assessment of the social and situational contexts of youth alcohol and marijuana use and simultaneous use might be helpful in future research and intervention planning. Youth perceived that dimensions such as the size of the group and how well they knew the other people present influenced their substance use decision-making, implying that not all parties may be alike in terms of risk of substance use. Larger parties or parties where there is a greater mix of unrelated actors may be particularly at-risk for heavy alcohol use and related negative outcomes, as youth described heavier alcohol use in these contexts to increase their own sociability. Further research should examine multiple characteristics of contexts in order to better identify specific contexts with enhanced risk.

Our findings suggest that both physiological effects of the substances and context characteristics shape the timing patterns of simultaneous alcohol and marijuana use. In our sample, simultaneous alcohol and marijuana use was often described as occurring over the course of an evening and encompassing multiple contexts. This suggests that temporality and contexts are important to understanding simultaneous alcohol and marijuana use behaviors in adolescents. It could be that specific patterns (e.g. drinking alcohol before smoking marijuana) could carry unique risks and be more likely in particular contexts. Further quantitative research that examines the sequencing of substance simultaneous use as well as how this sequencing varies by context could identify the best places and times for intervention. In addition, as theorized by Zinberg (1986), while our work provides support for the influence of “drug” and “setting” in substance use decision-making, we did not examine “set” (e.g. individual characteristics) which could also influence adolescent decisions about simultaneous use of alcohol and marijuana.

We also found that simultaneous alcohol and marijuana use were described as occurring in both transitional and destination contexts. The contexts where adolescents simultaneously use alcohol and marijuana often shift throughout the course of the evening, suggesting that interventions must pay attention to where and how adolescents move. While these findings will need to be validated with other samples, this may have significant implications for place-based interventions, as efforts that focus exclusively on one context without considering how adolescents move through space and time could have more limited effectiveness. For example, a recent examination of social host laws, which hold adults criminally or civilly liable for adolescent drinking on their property, suggests that they may be effective in lowering use in a specific context (drinking in a private home) but do not reduce the overall amount of drinking among adolescents (Paschall, Lipperman-Kreda, Grube, & Thomas, 2014). Additional quantitative research using real-time and geographic information systems data could be helpful in further capturing the complexities of simultaneous alcohol and marijuana use, contexts, and time among youth (Freisthler et al., 2014).

Although our study provides rich data on adolescent decision-making and context-specific patterns related to simultaneous alcohol and marijuana use, our findings cannot be

generalized to broader samples and should instead provide a launching point for theorizing and empirical research on these phenomena in larger quantitative and qualitative samples. The current exploratory study focused exclusively on simultaneous users of alcohol and marijuana, a specific sub-set of adolescent substance users who may be uniquely at-risk for greater substance-related problems. Also, as the focus of this analysis was simultaneous alcohol and marijuana use, our study does not address other drugs, such as heroin, that could have greater associated risks. However, the focus on simultaneous alcohol and marijuana use in our sample and thus in our manuscript is reflective of higher rates of these substances in adolescent populations (Johnston et al., 2017). Additionally, our participants were sampled from mid-sized cities and our population was relatively homogenous; other themes would likely emerge from more demographically and geographically diverse samples. Finally, our findings are based on adolescent self-report data, which could be prone to biases and do not provide direct observation of substance use behaviors.

Conclusion

Contexts appeared to matter in simultaneous alcohol and marijuana use among youth, but the decision-making and context-specific patterns described by youth participants were complex. Specifically, results of the current exploratory study showed that decisions about whether to use alcohol and marijuana simultaneously as well as simultaneous use patterns (e.g. the sequence in which substances were used) were informed by the context and the desired effect of the substance(s). Also, simultaneous alcohol and marijuana use was often described as occurring over the course of an event or evening in both transitional and destination contexts. Results suggest that future studies should consider the social, situational, and environmental richness of adolescent simultaneous alcohol and marijuana use patterns to gain valuable insight into potential interventions to decrease simultaneous use and to prevent negative consequences.

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