



Full length article

Cell phone-based ecological momentary assessment of substance use context for Latino youth in outpatient treatment: Who, what, when and where



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ABSTRACT

Background: Relationships between alcohol, marijuana and other drug (AOD) use and contextual factors have mostly been established through retrospective self-report. Given the embeddedness of cell phones in adolescents' daily activities, cell phone-based ecological momentary assessment (CEMA) provides an opportunity to better understand AOD use in youth and how cell phones can be used to self-monitor and deliver interventions. We use CEMA to examine AOD use in Latino youth who have been especially understudied.

Methods: Twenty-eight mostly Latino youth (ages 13–18) in outpatient substance abuse treatment recorded AOD use, contextual factors, cravings, and affect through once-daily CEMA over one month periods. Random-effects logistic regression was used to compare contextual factors between periods of AOD use and non-use.

Results: The most frequent contextual factors reported during AOD use were being with close friends and “hanging out” as the primary activity. During AOD use compared to non-use, youth were more likely to be with close friends (OR = 4.76; $p < 0.01$), around users (OR = 17.69; $p < 0.01$), and at a friend's house (OR = 5.97; $p < 0.01$). Alcohol use was more frequently reported at night (63% vs 34%) and on weekends relative to other substances (64% vs 49%). Strong cravings were more frequently reported on AOD-use days (OR = 7.34; $p < 0.01$). Types of positive and negative affect were reported with similar frequencies, regardless of AOD use.

Conclusions: Reporting on social context, location, day and time of day, and cravings all show promise in developing cell phone-based interventions triggered by contextual data.

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1. Introduction

Mobile technologies have the potential to revolutionize treatment programs for adolescent substance users. Current practices center on cognitive-behavioral therapies (Dennis et al., 2002, 2004; Kaminer, 2001) in which youth engage in group therapy, and which rely on retrospective assessments to self-monitor and identify relapse triggers. Cell phones expand the feasibility and reach of ecological momentary assessment (EMA); events are recorded in near real-time as they occur to elicit ecologically-valid data, reduce reliance on autobiographical memory and reduce recall biases (Bradburn et al., 1987; Piasecki et al., 2007; Shiffman, 2009; Shiffman et al., 2008; Stone and Shiffman, 1994). Mobile technolo-

gies also enable ecological momentary interventions (EMI; Heron and Smyth, 2010), for example, as tested in cell phone-based smoking cessation interventions for youth (Whittaker et al., 2008).

Before EMI can be fully realized in supporting drug treatment, a greater degree of granularity is needed in understanding daily behaviors, social contexts, and internal states in order to optimize the personalization inherent in EMI. To date, most information on substance use and contextual factors has been captured through retrospective assessments. Cell phone-based EMA (CEMA) studies in treatment settings are crucial for EMI development, particularly for adolescents given the prevalence of substance use problems, especially in Latino youth, and the high use of cell phones in adolescents' daily routines (Pew Internet and American Life Project, 2013). Higher levels of alcohol and drug use across multiple categories have been shown for Latino youth in the 8th and 10th grades compared to African American and Caucasian youth (Johnston et al., 2012). Moreover, Latino youth with substance use disorders

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(SUD) are less likely to receive treatment than White adolescents (Cummings et al., 2011).

In this vein, we pilot tested CEMA of alcohol, marijuana, and other drug (AOD) use in a sample of mostly Latino youth in outpatient substance abuse treatment. We previously reported high compliance rate for completing CEMA reports (Comulada et al., 2015). Here we explore contextual factors that were assessed along with AOD use in order to fill gaps in the literature related to the context in which adolescent AOD use occurs. We highlight practical applications of our findings for the development of EMI. Our pilot study tested different CEMA strategies that would likely be used in a treatment setting, including prompted (alarm-based) daily recall and event-based (self-initiated) reporting. As a secondary aim, we examine if context related to AOD use that is reported during daily recall differs from context reported through event-based reporting. To the best of our knowledge, this has not been explored in prior studies.

First, we summarize AOD-related contextual factors that have been evaluated in prior adolescent studies and that are evaluated in our study. We hypothesize similar findings in our sample, although we do so with caution. Prior research has mostly focused on social-contextual factors (Goncy and Mrug, 2013); this study makes a valuable contribution to the literature by giving equal attention to other contextual factors and affect. Moreover, prior findings are not generally based on Latino youth and are mostly based on retrospective assessments. Findings from (C)EMA studies are specified as such.

1.1. Who

Numerous studies have shown associations between AOD use in adolescents and AOD use in their peers (Kelly et al., 2012; Valente, 2010), as well as peer socioeconomic characteristics (van Dommelen-Gonzalez et al., 2015). What warrants further study are nuances in types of peer relations that relate to AOD use. For example, minority youth reported alcohol and marijuana use “among young people they knew”, relative to other substances in a qualitative study (Criss et al., 2016). Similarly, a study of young Australians found the majority of drinking episodes to occur with “close friends” (Dietze et al., 2014).

1.2. What

Hanging out and sleeping or resting have both been more frequently reported by youth on drinking versus non-drinking days through CEMA (Kauer et al., 2009); youth also spent less time studying on drinking days. Drug use has been found to be less likely among adult drug users while eating based on CEMA (Linas et al., 2015).

1.3. When

Alcohol and marijuana use have been more frequently reported by youth on weekends versus weeknights and after school relative to time periods before or during school (Goncy and Mrug, 2013). This is in line with the notion that alcohol is easier to detect and more limited to nighttime and weekend parties as reported by youth in qualitative interviews (Criss et al., 2016). It has also been noted that youth use alcohol and marijuana to attenuate sleep problems and sleep disturbances from other substances, such as stimulants used to increase daytime alertness (Bootzin and Stevens, 2005).

1.4. Where

A recent study of youth found marijuana to be most frequently used at a “friend’s house” and alcohol use to be split between use at

“one’s own home” or at a “friend’s house” (Goncy and Mrug, 2013). In the same vein, a study of Australian youth found heavy drinking to be reported more frequently at a “private house” relative to public locations, such as a nightclub (Dietze et al., 2014).

1.5. Cravings and affect

Cravings have been extensively evaluated through EMA and are associated with AOD use; see Serre et al. (2015) for a review. Affect has also been studied through EMA, although findings have been inconclusive with both positive and negative affect showing association with AOD use. Kauer et al. (2009) found higher negative mood on days when alcohol was consumed relative to non-drinking days in youth. In adult populations, alcohol consumption has been associated with both happiness and nervousness (Swendsen et al., 2000). Reports of anger have been associated with reduced drug use (Linas et al., 2015).

2. Methods

2.1. Participants

Youth were recruited from an adolescent outpatient substance abuse treatment setting in a large U.S. city from 2010 to 2011. All youth were in the treatment program because they exhibited some degree of impairment in school, social, or family environments. Eligible youth were: 1) between the ages of 12–18, 2) enrolled in treatment with an expected duration of at least a month, 3) able to use a cell phone, and 4) English speaking in order to fill out the CEMA (although language was not a barrier as all youth encountered spoke English). Youth who were 18 years old signed a consent form while younger youth signed assent forms and parental consent was also obtained.

Participating youth received a \$15 gift certificate for completing a baseline assessment. Over the course of the study, participants received \$25 per week and 500 free cell phone minutes per month. Study procedures were approved by the Institutional Review Board of the University (Comulada et al., 2015).

2.2. Procedures

After screening and consent, participants were administered a baseline assessment, assigned study cellular phone, and trained to fill out the CEMA. Youth were then assigned to one of three text message-based CEMA strategies (i.e., prompting and instructions) deemed to be appropriate in a treatment setting:

- *End-of-day assessment (EoDA)*: Youth received an automated text assessment once per day at 9:00 p.m. and were asked about AOD use, context, and affect *today*.
- *Random assessment (RA)*: Youth received one automated assessment per day at a random time between 3:00 p.m. and 9:00 p.m. The timeframe for RA was chosen so that CEMA would not occur during school hours. Youth were asked about AOD use that occurred *since the last survey* (i.e., “Since the last time you completed a survey did you use . . .”). Youth who indicated AOD use were queried on context and affect before they used. Youth were then asked about AOD use, context, and affect *in the moment* (e.g., “Who are you hanging out with now?”). Youth received in-the-moment context and affect questions, whether or not AOD use was indicated.
- *Event-based assessment (EBA)*: Youth were instructed to text a six-digit code to initiate the CEMA survey whenever they engaged in AOD use. Similar to RA, youth were queried on context and affect *in the moment*.

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