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Brief interventions for young adults who use drugs: the moderating effects of resilience and trauma

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Abstract

Among participants in an intervention clinical trial (N=602), we examined resilience as a moderator of substance use outcomes by intervention condition and between participants with and without severe traumatic stress (STS). Eligibility included men and women ages 18–39 with recent multidrug use; drug treatment enrollees were excluded. Outcome measures were past 90-day frequencies of substance use and abstinence. Putative moderators were measured using the Resilience Research Centre's Adult Resilience Measure (RRC-ARM) and the Traumatic Stress Scale from the Global Appraisal of Individual Needs (GAIN). Analyses employed hierarchical linear models. High resilience predicted better substance use outcomes, and the ordering of intervention effects for high resilience participants was stepwise by intervention condition intensity. Participants with low resilience scores had poorer outcomes, and those outcomes were largely unaffected by intervention condition. Participants without STS experienced the interventions similarly to the overall sample. Regardless of the level of resilience, however, participants with STS did not benefit from the interventions. The findings point to the importance of screening for both resilience and traumatic stress prior to intervention to maximize the impact of brief interventions for substance users, and also to link those needing more intensive approaches to additional services and professional care.

Keywords

young adult; drug abuse; nightclub; resilience; trauma

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Conflicts of interest
None.

Introduction

Electronic dance music (EDM) and other club/ rave venues are typically attended by young adults, many of whom report extensive alcohol and drug use in the context of intense weekend or multi-day event-based patterns (Kurtz, Inciardi, Surratt, & Cottler, 2005; Kurtz, Surratt, Buttram, Levi-Minzi, & Chen, 2013; Owen, 2003). Complex polydrug use in club scenes may lead to severe social and health consequences including criminal justice involvement (Buttram, Kurtz, & Paul, 2017; Kurtz, 2012; Voas, Johnson, & Miller, 2013); problems with friends and family members (Chinet, Stephan, Zobel, & Halfon, 2007; Singer, Linares, Ntiri, Henry, & Minnes, 2004); sexual risks for HIV and other sexually transmitted infections (Buttram & Kurtz, 2015; Novoa, Ompad, Wu, Vlahov, & Galea, 2005; Sterk, Klein, & Elifson, 2008); and substance dependence, drug overdose, and severe mental health problems (Cottler, Womack, Compton, & Ben-Abdallah, 2001; Kurtz et al., 2013; Parrott, Milani, Parmar, & Turner, 2001; Schifano, Di Furia, Forza, Minicuci, & Bricolo, 1998);

Moreover, the trendy, high-style reputation of the club scene masks the scope of childhood victimization found among drug-using EDM participants (Buttram et al., 2017; Kurtz et al., 2013); for many of them, abuse-related trauma is severe (Lawental, Surratt, Buttram, & Kurtz, 2018). Studies of childhood victimization have found that substance use and mental health disorders related to these experiences persist well into adulthood (Green et al., 2010; Min, Minnes, Kim, & Singer, 2013). For men and women with substance use disorders, comorbid traumatic stress makes substance abuse treatment more difficult, including increased risk of relapse and treatment failure (Eggleston et al., 2009; Mills, Teesson, Ross, & Darke, 2007; Ouimette, Finney, & Moos, 1999).

Resilience, on the other hand, may enable people to overcome diverse health and social problems in the face of adversity. Resilience is the ability to find and apply resources for support, engage in successful coping, or utilize other accessible protective factors where there has been exposure to risk or adversity (Obrist, Pfeiffer, & Henley, 2010; Ungar, 2008). Protective factors include assets (individual characteristics such as mastery, coping skills, self-efficacy), as well as external resources, such as social support and access to the services of community organizations (Fergus & Zimmerman, 2005). In the context of the present study, research has found, for example, that survivors of institutional child abuse who show behaviors synonymous with positive development (e.g., work or school engagement) are likely to exhibit less avoidant coping, report fewer trauma symptoms, and have a higher quality of life and global functioning (Flanagan et al., 2009). Likewise, a study of abused or neglected children found that almost half were resilient (e.g., lacked substance use and mental health disorders, had good educational achievement and social activity levels) during adolescence and almost one-third were resilient during young adulthood (DuMont, Widom, & Czaja, 2007). Resilience research among young adult not-in-treatment substance users remains scant, however, and studies of resilience as a moderator of treatment outcomes for substance users are not apparent.

The literature clearly documents the need for acceptable and effective interventions for young adults who use drugs within the context of club cultures. Polysubstance use is both normalized and glamorized in these settings, however, and clubgoing young adults who use

drugs have been found highly resistant to substance abuse treatment or other prescriptive interventions (Abdulrahim & Bowden-Jones, 2015; Kurtz et al., 2013; Marsden et al., 2006; Whittingham et al., 2009). Given this, the intervention described in the present study is a single-session health and social risk assessment which was evaluated for its impact on decreasing substance use and related health and social problems (Kurtz, Buttram, Pagano, & Surratt, 2017). The clinical trial examined the efficacy of the assessment intervention administered via personal- compared to self-interview modalities and to a waitlist control condition.

Although the presentation of intervention clinical outcomes based upon *a priori* assumptions and hypotheses is a central tenet of the scientific method, *post hoc* and subgroup analyses are important for identifying possible moderators of intervention outcomes, such as the characteristics of participants for whom a particular approach may have succeeded or failed, in order to inform future studies (Kraemer, Wilson, Fairburn, & Agras, 2002). Given that the clinical trial study found the experimental conditions to be efficacious relative to control (Kurtz et al., 2017), the overarching goal here is to distinguish characteristics of participants that may be used to predict the likely effectiveness of the brief interventions vs. those who need more intensive approaches. Thus, the aims for this paper are: (1) to examine resilience as a moderator of substance use outcomes by intervention condition among a sample of not-in-treatment young adults with extensive multidrug use; and (2) to examine resilience as a differential moderator of intervention outcomes between participants with severe traumatic stress (STS) symptoms and those without STS.

2. Methods

2.1. Study design

Data are drawn from a three-armed randomized controlled trial (RCT) designed to test the efficacy of two brief intervention conditions compared to waitlist control in reducing drug use and related health consequences among not-in-treatment adults ages 18 to 39 who use drugs in the context of EDM events. The intervention design was based upon an earlier natural history study that found that the administration of comprehensive health and social risk assessments to members of this target population led to large reductions in substance use and other risk behaviors over 18 months (Kurtz et al., 2013). In the RCT, the standardized assessment interventions were delivered in two modalities: 1) a computer-assisted personal interview conducted by an age-peer (hereafter, *Peer*), and 2) an audio computer-assisted self-interview (*Self*). The RCT study found intervention effects in a stepwise pattern: participants in the *Peer* condition reduced their drug use and related health consequences to a greater degree than participants in the *Self* arm, and both intervention conditions were efficacious compared to *Control*. The protocol is registered with [ClinicalTrials.gov](https://clinicaltrials.gov/ct2/show/study/NCT01362634) #NCT01362634. Further details of the study design and main findings may be found at Kurtz et al., 2017.

2.2. Sampling plan

The study was conducted in Miami, Florida, which has a metropolitan area population of 2.6 million; 66.2% identify as Hispanic, 18.9% Black and 14.8% White (US Census Bureau,

2015). A respondent-driven sampling (RDS; Heckathorn, 1997) approach was employed to recruit the sample of 750 participants during the period September 2011 through November 2014. Initial respondents were recruited through community advertisements and website postings; subsequent waves of recruitment were through referral from earlier participants.

To be eligible to enroll, participants were ages 18–39; attended well-known EDM nightclubs at least once per month; and reported the following health risk behaviors in the past 90 days: three days or more club drug use (i.e., powder cocaine, MDMA, LSD, methamphetamine, GHB and/or ketamine); non-medical prescription drug use (i.e., opioids, sedatives or stimulants); and heterosexual vaginal and/or anal sex. The sexual behavior eligibility criterion was deemed necessary to ensure the relevance of the intervention items targeting sexual risk reduction; enrollees who also reported same-gender sex were included. Substance use eligibility criteria matched those in the investigators' prior natural history study (Kurtz et al., 2013), and were designed to produce a sample with clinically significant levels of drug use. Any potential participant currently enrolled in a substance abuse treatment program was excluded.

2.3. Procedures

The project field office was housed in a commercial office building located on a main thoroughfare of the City of Miami. Upon enrollment, all participants were given a brief self-administered risk behavior inventory (RBI) questionnaire that assessed past 90-day frequencies of substance use, by drug, as well as sexual risk behaviors. The RBI, which required a median 12 minutes to complete, was constructed so that changes in risk behaviors over time could be measured among the control group with minimal reactive effects to the assessment. Randomization followed, with equal probability of assignment to the *Peer*, *Self* and *Control* conditions. The RBI was the only baseline activity for the *Control* group; those assigned to the intervention arms were administered the *Peer*- or *Self*-interview intervention protocols during the baseline visit.

Longitudinal data were collected at 3, 6 and 12 months after baseline using the self-administered RBI assessment of past 90-day substance use and sexual risk behaviors. The *Control* group was administered the *Peer* intervention at 12 months; participants in the intervention arms received an interviewer-administered health and social risk assessment equivalent to the *Peer* intervention excluding life history queries which had already been recorded at baseline. This aspect of the study design ensured the consistency of data collection procedures for all participants at each timepoint, except for the exposure of those in the *Peer* and *Self* intervention arms to their respective interventions at baseline.

2.4. Interventions

The intervention theoretical model is grounded in the literature on participants' reactive effects to research- and clinic-based assessments, such that these assessments lead to health risk behavior reduction through heightened self-awareness, self-monitoring, and self-efficacy (Clifford & Maisto, 2000; Epstein et al., 2005; Lightfoot, Comulada, & Stover, 2007). The intervention instrumentation, identical for *Peer* and *Self* conditions, is posted at <http://arsh.nova.edu/publications/forms/intervention-instrumentation.pdf>.

The interventions were largely based on the *Global Appraisal of Individual Needs* (GAIN, v. 5.4; Dennis, 2006), a substance abuse treatment intake instrument in wide use in the United States. The GAIN includes assessment batteries on demographics, substance use, mental and physical health, sexual risk behaviors, victimization, criminal justice involvement, and educational and occupational engagement. Each section includes queries regarding life history and past 90-day frequencies of experiences, behaviors and clinical symptoms, including *Diagnostic and Statistical Manual of Mental Disorders, 4th edition* (DSM-IV) diagnostics. The scope of inquiry was significantly expanded in adapting the GAIN for the *Peer* and *Self* interventions. The range of drug categories (e.g., ketamine; DMT) and sexual risk behaviors (e.g., group sex) was modified to be appropriate for the target population of young polydrug users. We also added well-tested measures of resilience, social support and coping skills. In programming the instruments for computerized administration, careful attention was paid to the inclusion of logically-bounded response choices, well-defined skip patterns and regular consistency checks to avoid missing or inconsistent responses during self-administration. *Peer* and *Self* intervention administration required about 60 to 90 minutes.

The *Peer* intervention was administered by an age-peer who had been trained to read the questions to the participant exactly as written and record their responses on a laptop computer without any further interaction. The *Self* intervention was administered on a desktop computer located in a private space; participants were able to read and/or listen to the questions before recording their answers.

2.5. Measures specific to the present analyses

Background characteristics.—Demographic measures included age, gender, race/ethnicity, and education. Victimization was assessed by the endorsement of one or more physical, sexual or emotional abuse events. Childhood victimization was defined as experiencing the first such event prior to the age of 18.

Resilience.—Resilience was measured using the Adult Resilience Measure developed and adapted from a screening tool designed for youth by the Resilience Research Centre (RRC-ARM; Ungar & Liebenberg, 2011). The RRC-ARM assesses individual, interpersonal, community and cultural resources available to assist people achieve positive outcomes despite significant adverse experiences. The RRC-ARM was selected for addition to the instrumentation because it measures the presence of protective mechanisms likely to be functional for at-risk younger adults, and has demonstrated high levels of reliability and external validity (Liebenberg & Moore, 2018).

The 28-item RRC-ARM uses a five-point Likert scale (“to what extent do the sentences below describe you?” where 1= “not at all” and 5 = “a lot”; e.g., “I am aware of my own strengths”, “I know where to get help in my community”) with a range of 28 to 140. In the present study, RRC-ARM scores were significantly negatively skewed; as done in prior resilience research (Hjemdal et al., 2011; Sood, Bakhshi, & Devi, 2013), and because definitive thresholds for resilience are not apparent in the literature, the measure was dichotomized at the natural cut-point nearest the median ($M=112$; $Mdn=113$; range=58–140;

$SD=15.73$; Cronbach's $\alpha=.888$), such that scores of 115 and higher denoted "high resilience" and scores of 114 and below, "low resilience." The 12-month follow-up RRC-ARM measure was used in these analyses because the instrument was not included in the interventions until partway through the study, such that baseline RRC-ARM data were incomplete. *Post hoc* analyses indicated that the baseline and 12-month measures were highly correlated and stable among participants for whom the measure was collected at both periods. Studies of the RRC-CYRM have demonstrated similar test-retest stability (Liebenberg, Ungar, & Vijver, 2012).

Severe traumatic stress.—The *Traumatic Stress Scale* is a count of past-year symptoms (e.g., "you had nightmares about things in your past that really happened") associated with exposure to traumatic events based on the Mississippi scale for PTSD (Keane, Caddell, & Taylor, 1988). Cronbach's α in the present study was .802. The index was dichotomized with scores of 5 or more of 12 symptoms indicating "clinically severe traumatic stress (STS)" (Dennis, 2006).

Substance use outcomes were measured at each data collection point as frequencies, in days, of use of alcohol, marijuana, powder cocaine, ecstasy, LSD, other hallucinogens (e.g., psilocybin, DMT), methamphetamine, and heroin, as well as the non-medical use of prescription benzodiazepines, opioids, and stimulants, in the past 90 days. Because all participants used multiple substances, we measured the substance use frequency outcome as the sum of past 90-day use of the four almost universally endorsed drugs: powder cocaine, ecstasy, and prescription benzodiazepines and opioids. A measure of abstinence was included as the second substance use outcome, "During the past 90 days, on how many days did you go without using 5 or more drinks, marijuana, cocaine, or any other drug?"

Protective factors.—We also report well-tested measures of protective factors used in social science research in order to examine their relationship to the resilience measure. Social Support was measured using 9 items adapted from the *MOS Social Support Survey* (Sherbourne & Stewart, 1991), a brief instrument including informational, tangible, affectionate, and positive social interaction domains. The items are measured on a 5-point scale ranging from "all of the time" to "none of the time." Cronbach's α was .910 in the present study. *The Brief COPE Scale* (Carver, 1997) assesses recent coping behaviors when under stress, rated on a four-point scale from "I've been doing this a lot" to "I haven't been doing this at all." We reduced the 11-item instrument to the five measures of positive coping behaviors (e.g., taking action, getting help and advice) and the five measures of negative coping behaviors (criticizing oneself; using alcohol and drugs to cope) to create two subscales with values ranging from 0 to 20; Cronbach's α s were 0.713 (positive) and 0.708 (negative).

2.6. Hypotheses

Based on the main study results (Kurtz et al., 2017), we expected to see greater improvement among subjects assigned to either intervention group compared to *Control*, and that those assigned to the *Peer* condition would reduce substance use to a greater extent than those in the *Self* arm. We also expected that high resilience would be associated with greater

improvement than low resilience. Because relevant literature is not apparent, this study explored, without hypotheses, the differential effects of the brief intervention and *Control* conditions among those with high versus low resilience, with and without STS.

2.7. Data Analyses

This report presents data for the 602 participants (80.2% of the enrolled sample) who completed the 12-month follow-up interview. Outcomes were examined on an intent-to-treat basis; statistical analyses were performed with SAS Version 9.3 using PROC FREQ, CORR, GENMOD, and MIXED procedures (SAS Institute Inc., Cary, NC). Fisher's Exact Test for categorical variables and the Kruskal-Wallis chi-square test for continuous variables were performed to evaluate differences between groups. Distributions of outcome measures were positively skewed and required logarithmic transformations. Statistics reported are based on log-transformed measures, including Cohen's d effect size statistics and related 95% confidence intervals. Effect size estimates of change in outcomes (adjusted) were calculated from the average difference score from the prior assessment divided by the standard deviation of the average change score, corrected by the correlation between time points (i.e., $[(M1 - M2) / SD] / (1 - r)$; Cohen, 1988). Formulas for converting between F, η^2 , and d were taken from Cohen (1988). Effect size estimates are categorized as 'small' (d=0.2), 'medium' (d=0.5), and 'large' (d=0.8) (Cohen, 1988). Low-moderate to high-moderate effect sizes in the field of substance use prevention trials are considered noteworthy (Dutra et al., 2008).

To explore whether resilience moderates the effects of brief interventions, two hierarchical linear models (HLMs) were constructed to examine intervention effects, resilience effects, and their interaction on substance use outcomes, controlling for age, gender, race/ethnicity, and the baseline assessment of the dependent variable. HLM models used the Satterthwaite degrees of freedom method well-suited for complex covariance structures (Bell et al., 2014), and subjects were modeled as random effects. Models predicting drug use and abstinence frequencies included a time term, a quadratic time term, and time*arm interaction; random effects included subjects and time, with an unstructured correlation matrix to allow for all possible correlations between the random intercept, random slope, and time. HLMs adjusted for the RDS design by using weighted least squares estimation as a function of exchangeable correlations among seed clusters that was invoked with the REPEATED statement as recommended for clustered data (Allison, 2012). These HLMs were then rerun separately for participants with and without STS. Bentler's comparative fit index (Bentler, 1990) of the HLMs performed were above the recommended level of .90 with values close to .95 (Allison, 2005). Examination of the correlation matrix for explanatory variables found no correlation to exceed $r=0.2$, and collinearity diagnostics indicated no problems. All two-tailed tests with significant values greater than 95% ($p<.05$) are reported.

3. Results

3.1. Sample characteristics

Sample characteristics by resilience level are shown in Table 1. There were no differences in arm assignment by resilience level. On average, participants were 25.8 years of age

($SD=5.4$, range=18–39) and the large majority (86.4%) had completed high school. About half (57%) were male. The racial/ethnic composition approximated Miami-Dade County's population: 64% Hispanic; 22.9% Black, 10.8% White and 2.3% other race/ethnicity. More than half (58.4%) reported histories of childhood victimization. No differences in demographics were observed between high resilience and low resilience participants, but childhood victimization was more prevalent among low resilience participants compared to those with high resilience scores (64.8% vs. 51.2%; $p=.001$). More than one-third (37.9%) of the sample endorsed STS; those with low resilience scores were about twice as likely to report STS compared to high resilience participants (50.2% vs. 24.0%; $p<.001$).

In the 90 days prior to baseline, large majorities (87% or more) of each sample arm endorsed the use of alcohol, marijuana, cocaine, MDMA, benzodiazepines and opioid analgesics; about half used LSD and prescription stimulants; and about 20% endorsed methamphetamine and heroin (these prevalences of various drugs used are not reported in the table). Differences in the prevalence of each substance did not differ by resilience level, except that a greater proportion of low resilience participants reported recent heroin use (23.8% vs. 15.2%; $p=.008$). There were no differences in the baseline values of the outcome measures - composite drug use and abstinence frequencies - by resilience level.

There was strong concordance of the RRC-ARM with the *Brief Cope* scales and the *MOS Social Support Survey* ($p<.001$ in the expected directions). High resilience participants scored higher than low resilience participants on measures of protective factors - social support and positive coping behaviors; correspondingly, the high resilience group scored lower than the low resilience group on negative coping behaviors.

3.2. Resilience and intervention outcomes

The effects of intervention condition and resilience level on substance use outcomes at 12 months are shown in Table 2. No significant effects of demographic and time covariates were observed, and these data are not reported in the table. As previously reported (Kurtz et al. 2017) a stepwise relationship of intervention effects was observed: the *Peer* vs. *Control* group effect size was moderate ($d=.40$ for both outcomes); the *Self* vs. *Control* effect size was small ($d=.21$, days drug use; $d=.22$, days abstinent) for both outcomes and the *Peer* vs. *Self* effect size was small ($d=.21$) for the days abstinent outcome and not detected for days drug use. Notably, *Self* participants showed very little improvement in the abstinence outcome measure, and the *Control* arm exhibited a *decrease* in days abstinent at 12 months. Participants with high resilience reduced their substance use (days drug use, $p<.0001$; days abstinent, $p<.05$) to a greater extent than those with low resilience; effect sizes were small ($d=.22$, days drug use; $d=.20$, days abstinent) for both outcomes.

Table 2 also shows differential intervention condition effects by resilience level, expressed in standardized effect sizes. High resilience participants exposed to the *Peer* intervention exhibited moderate effect size reductions ($d=.31$ to $.40$) in both substance use outcomes compared to those in the *Control* condition. The *Self* condition was not efficacious compared to *Control* for high resilience participants on the drug use frequency measure, and only a small effect size ($d=.21$) was observed for the abstinence measure. Intervention condition made no difference in outcomes for low resilience participants, except for a small

($d=.24$) effect size observed for abstinence frequency between the *Peer* and *Control* conditions.

3.3. Resilience and intervention outcomes by STS status

Table 3 shows HLM results among those with ($n=228$, 38%) and without ($n=374$, 62%) STS. Null findings of covariate effects on outcomes were maintained across subgroups and are not reported in the table. In the absence of STS, the findings mirror those for the whole sample: 1) the stepwise ordering of effects of intervention condition, such that the *Peer* group registered moderate effect size substance use reductions vs. *Control*, and the *Self* condition exhibited smaller effects but was still more efficacious than *Control*; and 2) high resilience participants reported larger reductions in days drug use compared to those with low resilience scores.

For participants with STS, however, differential effects by intervention condition and resilience level were generally not observed. The exception was for the abstinence outcome, for which those exposed to the *Peer* intervention condition improved, but participants assigned to the *Self* and *Control* conditions reported *decreased* abstinence.

4. Discussion

The RCT study found that an age-peer delivered comprehensive risk assessment intervention is an effective way of addressing drug abuse and related health and social problems among a young demographic of multidrug users from ethnically diverse (mostly visible minority) backgrounds (Kurtz et al., 2017). The present study supplements those findings with exploratory subgroup analyses that point to resilience and trauma as important moderators of these effects.

4.1 Resilience moderates intervention effects

For the sample as a whole, high resilience was associated with better substance use outcomes compared to those with low resilience scores, and the ordering of intervention condition effects for high resilience participants was stepwise: the person-delivered intervention performed better than self-assessment, which performed better than the *Control* arm. However, those with low resilience scores had poorer outcomes overall, and those outcomes were largely unaffected by intervention condition. Thus, screening for resilience prior to brief intervention would allow for the identification of those who need more attention to positive coping skills, enlisting social support, improving access to external resources, and other aspects of resilience. This finding echoes that of Ungar and colleagues (Ungar, Liebenberg, Dudding, Armstrong, & Van de Vijver, 2013) who found in a study of older adolescents and young adults using multiple mental health and social services that those who experienced increased resilience through their contact with professionals showed fewer problematic risk-taking behaviors, including substance use. They concluded that it is the quality of these personal relationships with service providers that increases resilience which then improves prosocial behavior.

4.2 STS moderates intervention effects

Examining STS status subgroups separately allowed us to examine the effects of intervention condition and resilience on outcomes in a more nuanced way. Participants without STS experienced the interventions similarly to the overall sample: *Peer* performed better than *Self* which performed better than the *Control* arm, and high resilience was associated with better outcomes compared to low resilience. Regardless of the individual's level of resilience, however, participants with STS were generally unaffected by the intervention. Essentially, untreated STS overwhelms the potential of resilience factors to support positive outcomes. The exception to this was the abstinence outcome: of those with STS, only those assigned to the person-delivered arm showed any improvement on this measure, while *Self* and *Control* participants reported significant worsening in abstinence over 12 months. While our results cannot explain why this pattern exists, it does suggest that the personal contact component of an intervention may moderate the impact of STS on drug use, but that our brief assessment approach is not sufficient to help them in a significant way.

This finding is substantially supported by the literature on STS and substance use. Traumatic stress, and not substance use severity at baseline/ intake, has been found to strongly predict the need for more intensive treatment for substance use disorders (Eggleston et al., 2009; Mills et al., 2007). This points to the importance of pre-screening young adults who use drugs for STS prior to attempting intervention. This approach would make the utilization of brief interventions like ours more efficient, while linking those with STS to the more intensive, professional care needed.

4.3. Limitations.

Our study has some notable limitations. Although the sample included proportions of gender and racial/ ethnic groups representative of the demographics of the recruitment area, our findings may not be generalizable to young adults who use drugs in non-EDM contexts or report lower levels of polydrug use. As well, our measures of substance dependence and mental health, including traumatic stress, relied on self report; as such, these findings may not be comparable to similar diagnostics assessed by a clinician. In this regard, we note evidence that young adults are the best informants of their internalizing behaviors (Pagano, Cassidy, Little, Murphy, & Jellinek, 2000). Finally, the RRC-ARM was measured at 12 months post-intervention rather than at baseline due to limitations in our data collection. Changes in resilience caused by exposure to different intervention conditions could not be measured, although we found the RRC-ARM to be stable over time among a subsample of participants who completed it at both assessments. Moreover, the concordance of the RRC-ARM in comparison to our other measures of protective factors suggests that informant ratings can be used as valid indicators of resilience.

4.4 Implications for the field and for future research

Despite these limitations, the study is strengthened by a large sample of ethnically diverse young adults, well-balanced demographics and risk behaviors across randomized trial conditions, high follow-up rates, and well-tested measures of resilience, mental health and drug use. Moreover, the subgroup analyses presented here strongly support the efficacy of an age-peer delivered comprehensive health and social risk assessment in reducing substance

use for young adults with good levels of resilience and without STS. Such an approach is acceptable to this population and operates primarily through self-awareness and self-monitoring (Kurtz et al., 2017).

Most significantly, these subgroup analyses indicate the importance of prescreening for both resilience and STS to maximize the impact of this brief intervention approach, and to ensure that those with higher levels of need are promptly referred to additional services. For those without STS but with low resilience scores, health and social services need to be provided by professionals who will offer a strong personal commitment to the client. For those with STS, the scientific literature supports the importance of prompt referral to mental health professionals who will address substance use within the context of comprehensive treatment for STS.

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References

- Abdulrahim D, & Bowden-Jones O (2015). Guidance on the Clinical Management of Acute and Chronic Harms of Club Drugs and Novel Psychoactive Substances. Retrieved from Novel Psychoactive Treatment UK Network website: <http://neptune-clinical-guidance.co.uk/wp-content/uploads/2015/03/NEPTUNE-Guidance-March-2015.pdf>
- Allison PD (2005). Fixed Effects Regression Methods for Longitudinal Data Using SAS: SAS Publishing.
- Allison PD (2012). Logistic regression using SAS: Theory and application: SAS Institute.
- Bell BA, Smiley W, Ene M, Blue G, Smiley W, Ene M, & Blue G (2014). An intermediate primer to estimating linear multilevel models using SAS® PROC MIXED. Paper presented at the SAS Global Forum Statistic and Data Analysis, paper 1869.
- Bentler PM (1990). Comparative fit indexes in structural models. *Psychological bulletin*, 107(2), 238. [PubMed: 2320703]
- Buttram ME, & Kurtz SP (2015). Characteristics associated with group sex participation among men and women in the club drug scene. *Sex Health*, 12(6), 560–562. [PubMed: 26342286]
- Buttram ME, Kurtz SP, & Paul RJ (2017). Sexual risk behaviours associated with unlicensed driving among young adults in Miami's electronic dance music nightclub scene. *Sexual Health*, 14(6), 584–586. [PubMed: 28578756]
- Carver CS (1997). You want to measure coping but your protocol's too long: Consider the brief cope. *International journal of behavioral medicine*, 4(1), 92. [PubMed: 16250744]
- Chinet L, Stephan P, Zobel F, & Halfon O (2007). Party drug use in techno nights: a field survey among French-speaking Swiss attendees. *Pharmacology Biochemistry and Behavior*, 86(2), 284–289.
- Cottler LB, Womack SB, Compton WM, & Ben-Abdallah A (2001). Ecstasy Abuse and Dependence Among Adolescents and Young Adults: Applicability and Reliability of DSM-IV Criteria. *Human Psychopharmacology*, 16, 599–606. [PubMed: 12404539]
- Dennis ML (2006). Global Appraisal of Individual Needs. Version 5.4. Bloomington, IL: Chestnut Health Systems.
- DuMont KA, Widom CS, & Czaja SJ (2007). Predictors of resilience in abused and neglected children grown-up: the role of individual and neighborhood characteristics. *Child Abuse Negl*, 31(3), 255–274. [PubMed: 17386940]

- Dutra L, Stathopoulou G, Basden SL, Levro TM, Powers MB (2008). A meta-analytic review of psychosocial interventions for substance use disorders. *Am J Psychiatry*, 165, 179–187. [PubMed: 18198270]
- Eggleston AM, Calhoun PS, Svikis DS, Tuten M, Chisolm MS, & Jones HE (2009). Suicidality, aggression, and other treatment considerations among pregnant, substance-dependent women with posttraumatic stress disorder. *Comprehensive psychiatry*, 50(5), 415–423. [PubMed: 19683611]
- Fergus S, & Zimmerman MA (2005). Adolescent resilience: A framework for understanding health development in the face of risk. *Annual Review of Public Health*, 26, 399–419.
- Flanagan E, Carr A, Dooley BA, Fitzpatrick M, Flanagan-Howard R, Shevlin M, Egan J (2009). Profiles of resilient survivors of institutional abuse in Ireland.
- Green JG, McLaughlin KA, Berglund PA, Gruber MJ, Sampson NA, Zaslavsky AM, & Kessler RC (2010). Childhood adversities and adult psychiatric disorders in the national comorbidity survey replication I: associations with first onset of DSM-IV disorders. *Archives of general psychiatry*, 67(2), 113–123. [PubMed: 20124111]
- Heckathorn DD (1997). Respondent-Driven Sampling: A New Approach to the Study of Hidden Populations. *Social Problems*, 44(2), 174–199.
- Hjemdal O, Friborg O, Braun S, Kempnaers C, Linkowski P, & Fossion P (2011). The Resilience Scale for Adults: Construct Validity and Measurement in a Belgian Sample. *International Journal of Testing*, 11(1), 53–70.
- Keane TM, Caddell JM, & Taylor KL (1988). Mississippi Scale for Combat-Related Posttraumatic Stress Disorder: three studies in reliability and validity. *Journal of Consulting and Clinical Psychology*, 56(1), 85. [PubMed: 3346454]
- Kraemer HC, Wilson GT, Fairburn CG, & Agras WS (2002). Mediators and moderators of treatment effects in randomized clinical trials. *Archives of General Psychiatry*, 59(10), 877–883. [PubMed: 12365874]
- Kurtz Steven P. (2012). Arrest histories, victimization, substance use, and sexual risk behaviors among young adults in Miami's club scene Pp. 151–166 in Sanders B, Thomas YF & Deeds B (Eds.), *Crime, HIV and Health: Intersections of Criminal Justice and Public Health Concerns*. New York: Springer.
- Kurtz SP, Buttram ME, Pagano ME, & Surratt HL (2017). A randomized trial of brief assessment interventions for young adults who use drugs in the club scene. *Journal of Substance Abuse Treatment*, 78, 64–73. [PubMed: 28554606]
- Kurtz SP, Inciardi JA, Surratt HL, & Cottler LB (2005). Prescription drug abuse among ecstasy users in Miami. *Journal of Addictive Diseases*, 24(4), 1–16.
- Kurtz SP, Surratt HL, Buttram ME, Levi-Minzi MA, & Chen M (2013). Interview as Intervention: The Case of Young Adult Multidrug Users in the Club Scene. *Journal of Substance Abuse Treatment*, 44(3), 301–308. [PubMed: 22971689]
- Lawental M, Surratt HL, Buttram ME, & Kurtz SP (2018). Serious mental illness among young adult women who use drugs in the club scene: co-occurring biopsychosocial factors. *Psychology, Health & Medicine*, 23(1), 82–88.
- Liebenberg L, & Moore JC (2018). A social ecological measure of resilience for adults: The RRC-ARM. *Social Indicators Research*, 136(1), 1–19.
- Liebenberg L, Ungar M, & Vijver F. V. d. (2012). Validation of the child and youth resilience measure-28 (CYRM-28) among Canadian youth. *Research on Social Work Practice*, 22(2), 219–226.
- Marsden J, Stillwell G, Barlow H, Boys A, Taylor C, Hunt N, & Farrell M (2006). An evaluation of a brief motivational intervention among young ecstasy and cocaine users: No effect on substance and alcohol use outcomes. *Addiction*, 101, 1014–1026. [PubMed: 16771893]
- Mills KL, Teesson M, Ross J, & Darke S (2007). The impact of post-traumatic stress disorder on treatment outcomes for heroin dependence. *Addiction*, 102(3), 447–454. [PubMed: 17298653]
- Min MO, Minnes S, Kim H, & Singer LT (2013). Pathways linking childhood maltreatment and adult physical health. *Child Abuse & Neglect*, 37(6), 361–373. [PubMed: 23195701]

- Novoa RA, Ompad DC, Wu Y, Vlahov D, & Galea S (2005). Ecstasy use and its association with sexual behaviors among drug users in New York City. *Journal of Community Health*, 30(5), 331–343. [PubMed: 16175956]
- Obrist B, Pfeiffer C, & Henley R (2010). Multi-layered Social Resilience: A New Approach in Mitigation Research. *Progress in Development Studies*, 10(4), 283–293.
- Ouimette PC, Finney JW, & Moos RH (1999). Two-year posttreatment functioning and coping of substance abuse patients with posttraumatic stress disorder. *Psychology of Addictive Behaviors*, 13(2), 105.
- Owen F (2003). *Clubland: The Fabulous Rise and Murderous Fall of Club Culture*. New York: St. Martin's Press.
- Pagano ME, Cassidy LJ, Little M, Murphy JM, & Jellinek MS (2000). Identifying psychosocial dysfunction in school-age children: The Pediatric Symptom Checklist as a self-report measure. *Psychology in the Schools*, 37(2), 91. [PubMed: 22328794]
- Parrott AC, Milani RM, Parmar R, & Turner JJD (2001). Recreational ecstasy/MDMA and other drug users from the UK and Italy: Psychiatric symptoms and psychobiological problems. *Psychopharmacology*, 159(1), 77–82. [PubMed: 11797073]
- Schifano F, Di Furia L, Forza G, Minicuci N, & Bricolo R (1998). MDMA ('ecstasy') consumption in the context of polydrug abuse: a report on 150 patients. *Drug Alcohol Dependence*, 52(1), 85–90. [PubMed: 9788011]
- Sherbourne CD, & Stewart AL (1991). The MOS social support survey. *Social Science & Medicine*, 32(6), 705–714. [PubMed: 2035047]
- Singer LT, Linares TJ, Ntiri S, Henry R, & Minnes S (2004). Psychosocial profiles of older adolescent MDMA users. *Drug & Alcohol Dependence*, 74(3), 245–252. [PubMed: 15194202]
- Sood S, Bakhshi A, & Devi P (2013). An assessment of perceived stress, resilience and mental health of adolescents living in border areas. *International Journal of Scientific and Research Publications*, 3(1), 1–4.
- Sterk CE, Klein H, & Elifson KW (2008). Young adult ecstasy users and multiple sexual partners: Understanding the factors underlying this HIV risk practice. *Journal of Psychoactive Drugs*, 40(3), 237–244. [PubMed: 19004415]
- Ungar M (2008). Resilience across cultures. *British Journal of Social Work*, 38(2), 218–235.
- Ungar M, & Liebenberg L (2011). Assessing resilience across cultures using mixed methods: Construction of the child and youth resilience measure. *Journal of Mixed Methods Research*, 5(2), 126–149.
- Ungar M, Liebenberg L, Dudding P, Armstrong M, & Van de Vijver FJ (2013). Patterns of service use, individual and contextual risk factors, and resilience among adolescents using multiple psychosocial services. *Child Abuse & Neglect*, 37(2–3), 150–159. [PubMed: 23260119]
- U. S. Census Bureau. (2015). State and County Quickfacts, Miami-Dade County, Florida Retrieved from <http://www.census.gov/quickfacts/table/PST045215/12086>.
- Voas RB, Johnson MB, & Miller BA (2013). Alcohol and drug use among young adults driving to a drinking location. *Drug & Alcohol Dependence*, 132(1), 69–73. [PubMed: 23415848]
- Whittingham JRD, Ruiter RAC, Bolier L, Lemmers L, Van Haset N, & Kok G (2009). Avoiding counterproductive results: An experimental pretest of a harm reduction intervention on attitude toward party drugs among users and nonusers. *Substance Use & Misuse*, 44, 532–547. [PubMed: 19242864]

Highlights

- Traumatic stress is prevalent among young adults in the club scene who use drugs.
- Resilience boosts efficacy of brief interventions for young adults who use drugs.
- Traumatic stress overwhelms resilience, limiting efficacy of brief interventions.
- Prescreening for trauma and resilience would maximize impact of brief intervention.

Table 1.

Baseline characteristics of young adult multidrug users by resilience level (N=602)

	Total 602 (100%)	High Resilience 283 (47.0%)	Low Resilience 319 (53.0%)	F or χ^2	P
Study arm					
Peer	213 (35.4%)	110 (38.9%)	103 (32.3%)	2.86	0.239
Self	194 (32.2%)	87 (30.7%)	107 (33.5%)		
Control	195 (32.4%)	86 (30.4%)	109 (34.2%)		
Background characteristics					
Age (Years; M,SD)	25.79 (5.42)	25.75 (5.29)	25.83 (5.54)	0.04	0.848
Education HS graduate	520 (86.4%)	249 (88.0%)	271 (85.0%)	1.17	0.279
Gender Male	343 (57.0%)	153 (54.1%)	190 (59.6%)	1.85	0.174
Race/ethnicity					
Hispanic	385 (64.0%)	191 (67.5%)	194 (60.8%)	3.38	0.337
Black	138 (22.9%)	59 (20.8%)	79 (24.8%)		
White	65 (10.8%)	26 (9.2%)	39 (12.2%)		
Other	14 (2.3%)	7 (2.5%)	7 (2.2%)		
Childhood victimization history	351 (58.4%)	145 (51.2%)	206 (64.8%)	11.31	0.001
Severe traumatic stress	228 (37.9%)	68 (24.0%)	160 (50.2%)	43.31	<0.001
Outcomes at baseline (past 90 days)					
Days drug use ^I (M,SD)	120.55 (85.89)	126.18 (87.65)	114.20 (83.58)	2.90	0.108
Days Abstinent (M,SD)	11.65 (14.25)	12.27 (15.08)	11.11 (13.47)	0.99	0.321
Protective Factors					
Social support scale (M,SD)	25.97 (8.59)	30.34 (6.15)	22.09 (8.59)	179.13	<0.001
Pos. coping behaviors (M,SD)	3.35 (1.53)	3.81 (1.37)	2.94 (1.55)	53.38	<0.001
Neg. coping behaviors (M,SD)	1.35 (1.36)	1.01 (1.21)	1.64 (1.41)	33.94	<0.001

^IDays drug use = sum of days use of MDMA, cocaine, benzodiazepines and opioids in the past 90 days (max value=360)

Table 2.

Effects of intervention condition and resilience level among young adult multidrug users (N=602)

		Days Drug Use ^I		Days Abstinent	
		<i>B (SE)</i>	<i>F</i>	<i>B (SE)</i>	<i>F</i>
Main effects:					
Arm (ref=Control)	Peer	−0.47 (0.15)	4.15 **	0.86 (0.21)	10.09 ****
	Self	−0.30 (0.16)		0.54 (0.22)	
Resilience (ref=Low)		−0.15 (0.11)	14.01 ****	0.01 (0.21)	3.09 *
			Group comparisons	Group comparisons	
Average change by group:					
Arm (ref=Control)	Peer	−0.46	Peer vs Self d=.08	0.57	Peer vs Self d=.21 *
	Self	−0.33	Peer vs Cont d=.40 *	0.04	Peer vs Cont d=.40 ***
	Control	−0.09	Self vs Cont d=.21 *	−0.63	Self vs Cont d=.22 *
Resilience (ref=Low)	High	−0.42	High vs Low d=.22 *	0.05	High vs Low d=.20 *
	Low	−0.32		−0.06	
Resilience by Arm		Low R	High R	Low R	High R
Peer vs Self		d=.07	d=.10	d=.14	d=.14
Peer vs Cont		d=.12	d=.31 **	d=.24 **	d= .40 ****
Self vs Cont		d=.15	d=.18	d=.11	d=.21 *

Notes:

*
 $p < .05$,**
 $p < .01$,***
 $p < .001$,****
 $p < .0001$; β =estimate; SE=standard error;^I Days drug use = sum of days use of MDMA, cocaine, benzodiazepines and opioids in the past 90 days (max value=360)

Table 3.

Effects of intervention condition and resilience level among young adult multidrug users with and without severe traumatic stress (N=602)

Variable	W/O severe traumatic stress symptoms, N=374 (62%)			With severe traumatic stress symptoms, N=228 (38%)		
	Days Drug Use ^J B (SE)	F	Days Abstinent B (SE)	Days Drug Use ^J B (SE)	F	Days Abstinent B (SE)
Main effects:						
Arm (ref=Cont)	Peer	-0.26 (0.10)	4.44 *	0.60 (0.32)	8.74 ***	1.65 (0.27)
	Self	-0.05 (0.09)		0.26 (0.33)		1.04 (0.26)
Resilience (ref=Low)		-0.08 (0.09)	4.01 *	0.16 (0.31)	0.69	-0.25 (0.29)
					1.30	1.86
Group comparisons						
Average change by group:						
Arm	Peer	-0.46	Peer vs Self d=.10	0.82	Peer vs Self d=.15	-0.43
	Self	-0.41	Peer vs Cont d=.30 *	0.44	Peer vs Cont d=.42 ***	-0.38
	Control	-0.28	Self vs Cont d=.20 *	-0.01	Self vs Cont d=.21 *	-0.26
Resilience	High	-0.43	High vs Low d=.20 *	0.48	High vs Low d=.11	-0.39
	Low	-0.33		0.33		-0.31

Notes:

* $p < .05$,

**

 $p < .01$,

 $p < .001$,

 $p < .0001$; β = estimate; SE = standard error.^J Days drug use = sum of days use of MDMA, cocaine, benzodiazepines and opioids in the past 90 days (max value=360)