

Mediating MDMA-Related Harm: Preloading and Post-loading Among Ecstasy-Using Youth[†]

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Abstract—Ecstasy use remains a key concern for professionals working in fields related to youth and drug use. At the forefront of these concerns are issues related to neurological dysfunction and depression—both acute and long-term—associated with MDMA use. Ecstasy users have been shown to assess Ecstasy related harms and to engage in a variety of practices to manage these risks. To contend with risk related to neurological dysfunction and depression, some youth have turned to “preloading” and “post-loading”: the practice of consuming other substances to mitigate the negative effects of Ecstasy. Drawing upon data from an ethnographic study of club drug use among youth, the author provides a descriptive profile of the practices of preloading and post-loading as well as the motivations underlying these behaviors among New York City area youth. Youth utilize a range of preloading and post-loading practices, yet do not universally share similar practices, attitudes, and knowledge. It is critical to link clinical and behavioral sciences research to further study both the efficacy and safety of these practices.

Keywords—club drugs, Ecstasy, harm reduction, pre-loading, post-loading, youth

With the global surge in Ecstasy use during recent decades, and the potential for harm associated with the use of Ecstasy, the continued study of the negative consequences related to Ecstasy use is critical. With its emergence as a significant recreational drug among youth, young people in particular bear the burden of risk. Dramatic increases in Ecstasy use among U.S. high school-aged youth occurred

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between 1996 and 2001, with lifetime prevalence figures almost doubling (Johnston, O'Malley & Bachman 2002). U.S. national data suggests similar increases during that time among 18 to 25 year olds (SAMHSA 2002). These trends have similarly emerged in Australia (Degenhart, Copeland & Dillon 2005), Europe (Bogt & Engels 2005; Soellner 2005), and Canada (Barrett et al. 2005), though not simultaneously. In some instances, the increase in Ecstasy use has led to negative health outcomes associated with the drug. Drug Abuse Warning Network data suggest that emergency room (ER) mentions of Ecstasy in New York coincided with the diffusion of Ecstasy's use and increased five-fold from the second half of 1998 to the first half of 2000, indicating that problematic outcomes rose along with more widespread use (CEWG 2001).

Since 2001, rates of Ecstasy use have plateaued in the United States, indicating that the diffusion period of the drug cycle has ceased and we have entered a period of stabilization. Nonetheless, Ecstasy remains a widely used substance, with roughly two million users in the U.S. during 2005 (SAMHSA 2006). In addition, though its diffusion has plateaued in America and Europe, Ecstasy use continues to diffuse in other regions of the world—e.g. Australia (Degenhardt, Barker & Topp 2004). Along with the proliferation of Ecstasy, the concern for harm associated with its use has diffused to various subsets of Ecstasy-using populations as well. Two key harms concerning scientists and health professionals as well as Ecstasy users themselves are neurological dysfunction and depression.

NEUROLOGICAL DYSFUNCTION

Neurological dysfunction, both acute and long-term, remains a primary concern of scientists and public health professionals involved in the study of Ecstasy use. Neurological dysfunction remains a complicated topic mainly because there is no universal definition of neurotoxicity and the range of effects on the brain varies (Baggott & Mendelson 2001). With a holistic and inclusive definition, neurological dysfunction may comprise anything related to toxic effects on the brain from serotonin depletion in the days following Ecstasy consumption to acute cognitive impairment to long-term cognitive damage or permanent alteration of neurons in the serotonergic system. MDMA works on several components of the brain, including both the serotonergic and dopaminergic systems, and as a result could affect the brain through several mechanisms. For example, neurological dysfunction and changes to mood regulation could potentially arise in various ways, from reductions in cerebral blood flow (Chang et al. 2000) to the alteration of axons in the brain due to oxidative stress (Jayathi et al. 1999; Shankaran, Yamamoto & Gudelsky 1999) to other serotonergic changes in the brain.

Acute neurological dysfunction may include acute memory loss and other short-term cognitive impairment in the days following the use of MDMA (Parrott & Lasky 1998). Some users complain of being left in a cognitive fog in the wake of a weekend of Ecstasy use. They report difficulty with attention span as well as cognitive processing ability. Curran and Travill (1997) found significant impairment on attention and working memory after the use of Ecstasy in comparison to alcohol users. At times, youth refer to this as feeling “cracked out,” while others assert they sometimes feel like a “zombie” in the days after using the drug (Kelly 2005). In addition to cognitive confusion and depression, Topp and colleagues (1999) found irritability and sleep difficulties to be significant acute psychological problems in the days after use of Ecstasy.

Increasing evidence suggests that MDMA may have long-term neurotoxic effects as well, particularly for heavy

users. Long-term neurotoxic effects of MDMA may include a wide range of effects such as impaired memory, diminished attention capacity, impulsivity, alteration of mood, and other cognitive impairments. Several studies have found evidence of long-term memory impairment among current and former users of Ecstasy. These effects on memory appear to be multifaceted (Yip & Lee 2005). Ecstasy users have been found to be impaired on both verbal memory and delayed memory (Rodgers 2000). Others have found Ecstasy use to impair working memory (Wareing et al. 2005). Some contend that the association of Ecstasy use and memory impairment has been confounded by the concomitant use of other drugs, including marijuana (Simon & Mattick 2002). However, Halpern and colleagues (2004) found impairment among Ecstasy users with minimal exposure to other drugs. Beyond memory impairment, Ecstasy use has been associated with impaired attention span among former users of the drug (Yip & Lee 2005). Ecstasy use has also been associated with adversely affected impulse control (Morgan 1998). Some studies suggest that neurological dysfunction is dose-related, with neurotoxic effects being correlated with heavy consumption, thus suggesting that binges of Ecstasy use and great cumulative consumption over time pose greater risk of neurological dysfunction (Yip & Lee 2005; Parrott et al. 2002; O’Shea et al. 1998).

DEPRESSIVE SYMPTOMATOLOGY

Depressive disorders linked to the neurotoxic effects of Ecstasy use also concern scientists and public health professionals. The potential for depressive disorders is related to neurotoxicity via concerns about the possibility of permanent alteration of the serotonergic system, a portion of the brain associated with the regulation of mood and psychological well-being. An acute period of depression in the days following Ecstasy consumption has been well-documented (Travers & Lyvers 2005; Curran & Travill 1997). This is generally believed to relate to the process of restoration of the serotonin system after the disruption due to the induced flooding of serotonin during the Ecstasy experience. The potential for long-term depressive disorders, however, remains unclear given our inability to distinguish between pre-morbid or latent depression and Ecstasy-induced depression during retrospective assessments. Several research teams have found both current and former Ecstasy users to score significantly higher on Beck Depression Inventory (BDI) scales of depressive symptomatology (de Win et al. 2004; Roiser & Sahakian 2004). However, in a large community sample, Falck and colleagues (2006) found a majority of Ecstasy users to score in the nondepressed/minimal depression categories. In addition, they found the overall prevalence of clinically significant depressive symptoms to be lower than other nonmedical drug user samples and thus the potential for confounding by other drug use remains unclear. For example, those with backgrounds of opiate use rated

significantly higher on the BDI scale than other Ecstasy users (Falck et al. 2006). Yet, like other potential neurotoxic effects of Ecstasy, it appears that heavy cumulative use is significantly associated with the likelihood of suffering from depressive symptomatology (Falck et al. 2006; de Win et al. 2004). Clinical evidence of diminished 5-HT binding in the brain among Ecstasy users also suggests this effect is dose dependent (McCann et al. 1998). Yet, evidence suggests that a single dose of MDMA is unlikely to cause clinically significant damage to neurons in the serotonin system (Vollenweider et al. 1999). Ultimately, conclusive evidence on the causal effects of MDMA on depressive disorders remains unclear. Further research on the links between Ecstasy use and long-term depressive disorders is necessary to provide fuller accounts of the potentially toxic effects on the serotonin system.

Though these concerns have largely been expressed on behalf of a relatively young population, since the surge in Ecstasy use remains relatively recent, it remains unclear whether long-term effects of MDMA use surface only with aging during the life course. Much remains uncertain about the neurological dysfunction of MDMA given that prospective clinical studies on MDMA-naïve humans have not been conducted for a variety of ethical reasons. It is perhaps safe to say that the ramifications of long-term neurological dysfunction are not yet fully understood and for this very reason caution should be urged.

ECSTASY AND HARM REDUCTION

It remains widely acknowledged that there are potential harms associated with the use of any drug, regardless of its legal status. Many of the potential harms associated with MDMA use are well recognized among youth who consume Ecstasy, and their conceptions of risk often echo those of professionals (Kelly 2005). Gamma and colleagues (2005) suggest that a substantial majority of Ecstasy users recognize some form of risk associated with their use of the drug. As such, various groups of Ecstasy users have been shown to assess Ecstasy-related harms and engage in a variety of practices to manage these risks (Kelly 2007; Southgate & Hopwood 2001; Akram & Galt 1999). Indeed, Akram and Galt (1999) estimated that over four out of five Ecstasy users they surveyed indicated the use of some form of harm reduction method associated with their Ecstasy consumption. Though perhaps methadone maintenance and syringe exchange programs are the most widely known harm reduction methods for intervening with drug users, Ecstasy users engage in a very broad range of practices aimed at mitigating the harms associated with MDMA consumption (Kelly 2007; Southgate & Hopwood 2001). Though not limited to these practices, Ecstasy users cite moderation, water consumption, "chilling out," and pill-testing as key forms of harm reduction that become intertwined with their typical patterns of consumption.

Beyond the individual, harm reduction frameworks have become guiding forces in the subculturally-engrained, normative patterns of use within club and rave subcultures. Many of these risk management practices both circulate informally within club subcultures (Kelly 2007; Southgate & Hopwood 2001) and have been institutionalized through subculturally specific harm reduction organizations, such as DanceSafe and RaveSafe (Holland 2001). Both forms of knowledge and practice have been instrumental in shaping contemporary Ecstasy practices. Operating at this subcultural level, they provide a set of standards for subculturally-involved initiates. Indeed, "flight guides" emerged early on from psychedelic enthusiasts who used MDMA (Rosenbaum 2002), and many of the principles underlying such guides diffused more broadly within club subcultures and remain the guiding frameworks for contemporary Ecstasy use. As subculturally-involved youth continue to use and discuss the drug, new Ecstasy harm reduction practices continue to emerge and become entrenched in these subcultures.

PRESENT STUDY

As noted above, youth engage in a range of practices aimed at minimizing the risks associated with their Ecstasy use. To contend with the potential for harm specifically related to neurological dysfunction and depression, many youth have turned to the practices of "preloading" and "post-loading." Preloading and post-loading constitute intentional strategies utilized by Ecstasy-using youth to reduce the likelihood of both acute and long-term risks of Ecstasy use. When engaging in preloading and post-loading, youth consume other substances perceived to mitigate the negative effects of Ecstasy use, primarily the potential for depression and neurological dysfunction related to MDMA consumption. Preloading is the practice of ingesting of these substances prior to the use of Ecstasy, perhaps planned as far in advance as a few days before the use of Ecstasy or occurring just minutes before Ecstasy consumption occurs. Post-loading, conversely, is the practice of ingesting certain substances after Ecstasy has been consumed. Post-loading may take place during the "come down" phase as the effects of the drug wane or within the days following the experience of using Ecstasy. These practices were significant enough in the lives of Ecstasy-using youth that discussions of these practices organically emerged during the course of interviews with them. The following study uses ethnographic data to describe the practices of preloading and post-loading as well as the motivations underlying these behaviors among New York City metropolitan area youth.

METHODS

These data are drawn from an ethnographic study of club drug use among "Bridge and Tunnel" youth in the New York City metropolitan area. Bridge and Tunnel is local

vernacular for youth who hang out or party in Manhattan but who reside in suburban neighborhoods surrounding New York City. These youth are thus a population engaged in urban social scenes as well as everyday suburban existences. Thus, involved in multiple social worlds, these youth provide a window from which to examine the patterns of club drug use in both urban and suburban locales.

Procedures

The prospect of data collection from a population without roots in the location of study poses numerous challenges. Manhattan has an enormous club scene and a key challenge consisted of creating a social map to identify the key venues in which Bridge and Tunnel youth socialize. On various nights of the week over a six-week period, social mapping fieldwork and "intercept" interviews with suburban youth were conducted by the author. Intercept interviews occurred at major points of entry in Midtown Manhattan, such as Penn Station and Grand Central Station and consisted of a brief, structured interview determining their county of residence, preferred music genre, and the venues at which they preferred to socialize in Manhattan. I also conducted informal interviews through participant-observation in environments in which Bridge and Tunnel youth socialize. The first two months of participant-observation, which overlapped with the intercept interview period, was focused upon social mapping.

Participant-observation was conducted over the course of eighteen months from the Spring of 2003 through the Fall of 2004. The key feature of the participant-observation method is that the researcher becomes immersed within the social milieu of local venues. During the cultivation of this extended presence, the ethnographer observes social behavior in the context of participation in a variety of activities with the "natives." Such a presence not only enables the recruitment of interview participants through the development of rapport, but also enables the ethnographer to thickly describe emerging trends (Geertz 1983). It also facilitates the ethnographer's ability to assess patterns of observed behavior and link these observations to interview data to cultivate fuller interpretations of behavioral patterns and subcultural social norms. Furthermore, it eliminates a need to rely on the self-report of respondents, thus further increasing the validity of the data. All fieldwork resulted in descriptive documentation in fieldnotes, which were written as soon as possible after the event (Sanjek 1990).

In addition to ethnographic fieldwork, respondents were recruited from club venues through a theoretical sampling scheme for inclusion into an in-depth interview cohort (Strauss & Corbin 1998). Theoretical sampling is a means of case selection aimed at generating a sample on the basis of a diverse range of conceptually salient characteristics (Strauss & Corbin 1998). Inclusion criteria for the young men and women recruited for in-depth interviews was as follows: (a) individuals between the ages of 18 and 25, (b)

who reported the use of one of four drugs—MDMA, ketamine, methamphetamine, or GHB—within the previous year, (c) who resided in a suburban county outside New York accessible by public transport and (d) who were willing and able to consent to participation. Respondents participated in between one and five anonymous audio-taped interviews that lasted between one and 2.5 hours and were transcribed verbatim. Informed consent was obtained from all respondents for the in-depth interviews as per the Institutional Review Board approved protocol. The study operated under a Federal Certificate of Confidentiality to ensure protection of sensitive data elicited from respondents. All names within this article are pseudonyms.

A standardized semi-structured in-depth interview guide was utilized in the initial interview with each respondent, and follow-up interviews were aimed at exploring issues developed in previous interviews. The interviews consisted of open-ended questions designed to gain an insider's perspective on a range of salient issues pertinent to club drug use (Geertz 1983). Ethnographic interview techniques such as critical incident measures as well as analytic contrasts were employed in order to gather detail-rich data with reduced recall bias (Leonard & Ross 1997). Initial interviews occurred at a time and location agreed upon with the respondent, often in the suburbs. Follow-up interviews occurred a minimum of two weeks from the previous interview so as to allow the respondent time to contemplate issues raised and to allow the investigator time to digest and initially interpret the data so as to more pointedly direct the follow-up interview. A thematic analysis of data was employed to discern emerging themes salient in the lives of these youth. NVIVO2—a qualitative data analysis software useful for indexing and coding data—was utilized in the process of analysis. The quotations employed in this study provide descriptive evidence of thematic patterns across the interviews. All quotations are derived from taped in-depth interviews, except where noted.

Study Participants

The data for this study were drawn primarily from interviews with 40 Bridge and Tunnel youth hailing from New Jersey, Long Island, and the Mid-Hudson suburbs of New York City. These youth ranged in age from 18 to 25 with a mean age of roughly 21 years old. They had an average monthly income of \$1,800, with a range of \$600 to \$4,000, from a variety of jobs, such as part-time florist, drug dealer, and marketing analyst for a multinational corporation. They were well educated; most were either currently enrolled in college or had completed college. The cohort consisted of 28 White youth, seven Latino youth, three Asian youth, and two youth of "mixed" race. Ecstasy was the primary club drug utilized by these youth, which supported existing prevalence data on club drugs. These youth had all used Ecstasy during the course of their lives. The average number of occasions within the last year on which

Ecstasy pills were consumed was roughly 13, with a range of one to 60. In other words, many of these youth were not exceptionally heavy consumers of Ecstasy. Ketamine had been used to a lesser degree among this group though it was still prevalent. Methamphetamine and GHB had been used by few participants.

RESULTS

Though not universal practices among Ecstasy users, pre-loading and post-loading emerged organically as significant issues in the lives of numerous youth encountered during the course of fieldwork. These youth reported consuming a variety of substances in the acts of preloading and post-loading, which included mainly over-the-counter vitamins and nutritional supplements, but pharmaceuticals as well. The specific substances cited by youth as useful for preloading and post-loading included 5-hydroxytryptophan (5-HTP), selective serotonin reuptake inhibitors (SSRIs), ginko biloba, St. John's wort, vitamin C, and multivitamins. They were used for a variety of reasons; the rationales behind their use varied from substance to substance and even from user to user. Regardless, the use of other substances for pre-loading and post-loading purposes revolved around reducing the likelihood of neurological dysfunction, depression, and impaired cognitive functioning. Overall, these practices were believed to maintain the cognitive integrity of the brain, improve functioning at mental tasks, and sustain mental health.

Serotonergic Substances

Many youth were aware that MDMA affects the serotonergic system in the brain. As such, serotonin related agents like SSRI's and 5-HTP were used by youth to mitigate both depression and neurological dysfunction. SSRIs are medications typically prescribed for the treatment of depression and other mental illnesses. They work by slowing the reabsorption of serotonin, the same neurotransmitter released by MDMA and one which plays a key role in mood regulation. 5-HTP is a serotonin precursor and is produced naturally within the body. The intake of 5-HTP, when metabolized by the body, may produce an increase in serotonin. 5-HTP is commonly sold in pill form by health food stores as an alternative to the pharmaceutical treatment of depression.

These agents are said by youth to have restorative properties for the serotonergic system and thus are believed to act by accelerating the process by which the serotonergic system recovers from Ecstasy use. Thus, the users of serotonergic substances for pre/post-loading believe they quicken recovery. For example, Ed said, "Obviously, there's depression that comes after [Ecstasy use]. It's pretty bad, but when you just go do 5-HTP, it would probably be for a short time." For Ed, the use of 5-HTP is perceived to reduce the duration of ecstasy-related depression. Andy also discussed his

experiences with pre-loading and post-loading in a positive light. He said,

Without it [preloading and post-loading with 5-HTP] my mind would feel as if . . . it's kind of like right after the day I took E, my mind would feel totally blank and I would feel like a hangover I guess. I can't think. I can't concentrate on anything. It's as if my mind was shut down for the next couple of days. But if I do take it, the 5-HTP, I can go on with my normal day.

Thus, Andy asserted that the acute negative cognitive effects were diminished through his use of 5-HTP. He also noted that taking 5-HTP has dramatically reduced his post-E depression. However, he noted a drawback of using 5-HTP for pre-loading. He said, "If you take too much 5-HTP it can cause some tough stomach ache you know that's messed up." Thus, the practices were not always without unwanted side effects.

Andy also described using Prozac in a similar way: "There are some people who take Prozac. I could get Prozac and I've tried using Prozac but it pretty much works the same way. It's just easier to get some 5-HTP." Similarly, Paul described using Prozac, a popular SSRI, to reduce the crash associated with Ecstasy use. He said, "Prozac helps with the depression though. (How so?) Well, the Ecstasy makes your body release serotonin and Prozac works on the part of your brain that makes serotonin. That's why it makes people less depressed. So, if you take it when you use Ecstasy, you won't feel as shitty afterwards." Thus, the direct link of both SSRIs and MDMA to serotonin production informs the perceptions of youth that SSRIs may be useful in ameliorating depressive symptoms associated with Ecstasy consumptions.

Thus, the use of serotonergic substances such as 5-HTP and SSRIs may ameliorate the negative aftereffects of an episode of Ecstasy use. However, whether this provided any long-term benefit remains unclear. The youth who engaged in these practices primarily cited their utility for contending with acute effects.

Herbal and Other Supplements

Other youth used nutritional supplements from health food stores for less specific pre/post-loading purposes. Unlike SSRIs and 5-HTP, nutritional supplements were not reported by youth to act directly on the serotonin system. Rather, these supplements contributed to mental health and well-being more generally. St. John's wort, for example, was used by some youth specifically to stave off post-E depression. In the following exchange, Tim described such a practice when he recounted to me an experience of post-loading with St. John's wort:

T: Then, at the end of the night, I took some St. John's.

B: St John's?

T: Yeah, you know, it's like St. John's warts (sic). You get it from a health food store.

B: Oh OK. St. John's Wort. Why did you take that?

T: For the depression, you know. Sometimes I kind of crash after taking E-pills and the St. John's helps with depression. One of my aunts is depressed and she takes it. I got my own though.

B: And what happened? How did it work for you that time?

T: That time? Yeah. That time, I think it did. It doesn't work every time. Usually though.

B: And do you have to do anything else to get it to work?

T: Do anything? Like take something else too? Nah, I just take a couple when I get home before I go to bed and hope it works.

Tim began his use of St. John's Wort because it has been popularly associated with reductions in depression, such as his relative's use of the substance. He didn't spell out the specific means by which he believed it works, unlike those who take SSRIs or 5-HTP specifically because of their effects on the serotonergic system. Rather, the specific mechanism by which it worked remained unclear to him and he viewed it as a general means to prevent the depressive state that emerges in the wake of Ecstasy use.

Other health supplements were taken similarly in generalized efforts to reduce depression and the effects of neurological dysfunction. Ginkgo biloba is said to reduce the hangover and "cracked out" feeling for some. As Joe said:

You mean, like when I feel fucked up afterwards? Well taking ginkgo biloba helps. I mean, that's supposed to be good for your brain anyway. So, I don't usually take it after I use Ecstasy, but I have and I guess it's good. I mean, anything you can do to help your brain after you use Ecstasy is going to have some sort of benefit, right? So, that's something I should probably do more often, take ginkgo biloba.

Joe spoke about a generalized attempt to enhance brain functioning by using ginkgo biloba, though it was not a regular practice on his part. Since ginkgo biloba has been touted as a "brain drug" by some, youth may sometimes pre-load and post-load with it in an effort to reduce the feelings of a cognitive fog in the wake of the experience of Ecstasy use.

Vitamins

Youth also reported taking vitamins during the course of preloading and post-loading. Vitamin C, which is also rumored to enhance the Ecstasy high, was perceived to assist with the body's capability to process MDMA and multivitamins in an effort to "replenish the body." The use of vitamins typically occurred among those who cited nutritional balance and well-being as important for reducing the negative consequences of Ecstasy use.

Jane discussed having used vitamin C both to improve the high and to cleanse her system more readily. When I asked her why she drinks orange juice each time she takes Ecstasy, she said, "And um, a lot of people [say] it intensifies it. Because if the Ecstasy's crappy, drink a lot of vitamin

Cs and it will hit you great. Because like, basically what I heard, that's what I heard, so . . . it absorbs Ecstasy faster and you get it out of your body faster." Thus, vitamin C was perceived by some to increase the efficiency by which the body processes MDMA. Others reported taking vitamin C tablets along with Ecstasy. Regardless of its form of intake, vitamin C is perceived to result in both an enhanced high and an expeditious purge from the body.

Taking extra multivitamins serves a related purpose in that the user can replenish the body with nutrients needed to ease the post-Ecstasy crash. As Mary noted, "Well, it's like with anything, you want to make sure your body has what it needs. Sometimes if I know I'm gonna use E, I'll make sure I take like Centrum or some kind of vitamins on the days before it, just to get my body prepared. I'll try to take them for a couple days after I use E too." Taking a range of vitamins is believed to facilitate a reduced hangover or crash by maintaining the necessary levels of vitamins, minerals, and electrolytes within the body. Again, this is a more generalized effort to maintain health and well-being in the period after the high from Ecstasy consumption wanes.

General Issues

The use of such preloading and post-loading techniques did not appear to be universal among these youth. Though overlapping among some, differing sets of beliefs and knowledge bases led to different preloading and post-loading practices. Due to the organic emergence of this issue during the course of the study, it was not possible to produce a prevalence estimate from the youth interviewed. In addition, though some youth referred to "preloading" and "post-loading" by these specific names, not all youth had heard of these terms. As such, it appears that these practices are spreading without direct linkage to any formalized mechanisms. Furthermore, the youth interviewed were often vague with regards to how they began using these harm reduction methods. Some asserted they learned it from friends, while others discussed websites that they relied upon for information about the drugs they used. As a whole, the diffusion of these practices within club and rave subcultures primarily appears to rely upon the social networks in which these youth are rooted.

DISCUSSION

As Ecstasy use maintains its current pace, people will continue to develop folk pathways to reducing risk. In particular, individuals involved in electronic dance music subcultures who use club drugs have been shown to be particularly interested in harm reduction methods (Kelly 2005; Southgate & Hopwood 2001; Akram & Galt 1999). As the perceived utility of these methods to combat neurological dysfunction and depression become more widely known, such harm reduction practices dissipate further throughout and beyond club subcultures. As such, preloading and

post-loading have become strategies employed by youth to reduce the risks of neurological dysfunction and depression associated with Ecstasy use (Kelly 2007; Allott & Redman 2006). These efforts reflect a keen intentionality on the part of some youth with regard to evaluating and contending with risk. As such, these practices are aimed at minimizing both immediate and long-term damage specifically associated with Ecstasy use. It remains uncertain exactly how widespread preloading and post-loading practices are, but they exist among experienced users of Ecstasy in the New York City metropolitan area and research suggests they are practices in current use outside of the U.S. as well, particularly in Australia (Allott & Redman 2006; Copeland, Dillon & Gascoigne 2005).

The youth who discussed their experiences of preloading and post-loading used a range of strategies with varying implications. Their preloading and post-loading practices appear to be anything but standardized as some youth prefer the use of certain substances over others. The different substances used in these practices are seen to work by different mechanisms and yet all are perceived to make positive contributions towards health and well-being in the wake of Ecstasy use. Some substances, such as 5-HTP and SSRIs, are viewed by youth as acting specifically on the same mechanisms in the brain—the serotonin system—on which MDMA itself works. Thus, such practices are seen as a direct intervention on the deleterious effects of MDMA use. Other substances, such as vitamin C and ginkgo biloba, are recognized as more generalized in their healthful effects and are not perceived to be directly tied to the pharmacological mechanisms of MDMA per se. It remains unclear as to whether such substances are specifically used for MDMA only or are more generalized harm reduction measures for their drug use.

Although the practices of preloading and post-loading have seemingly become more widespread, little is known about the clinical effects in humans of the combination of MDMA and the other substances used for preloading and post-loading. It appears that these practices may be rooted in data derived from nonhuman clinical research studies. Several studies conducted upon animals have shown that the use of certain substances—including vitamin C (Shankaran, Yamamoto & Gudelsky 2001), SSRIs (Malberg, Sabol & Seiden 1996), and 5-HTP (Sprague et al. 1994)—reduced the neurotoxic effects of MDMA. The mechanisms by which these practices work may be through reductions in oxidative stress as well as amelioration of serotonin depletion. Though none of the youth interviewed mentioned the scientific literature as sources for the practice, these trials may provide

the basis from which preloading and post-loading emerged. Despite this, few studies of these issues have been conducted on humans.

Given the diffusion of these practices among youth involved in club and rave subcultures, it is imperative that studies evaluating the combination of these substances be conducted. Primarily, it remains unclear to what extent these practices actually work to reduce neurological dysfunction and depression. Given that the interest in harm reduction among youth involved in these subcultures has been well documented, regardless of whether they actually work, such practices may spread widely within these scenes as a means of building up subcultural capital (Thornton 1995). Thus, regardless of efficacy, the use of such practices may primarily serve to raise one's esteem among peers due to the sophistication and savvy associated with such harm reduction practices. Yet, if these practices prove ineffective—or worse, harmful—it is important to consider whether endeavors at social acquisition ultimately benefit the practitioner or merely mislead the individual down a path of risk misrecognition.

Beyond determining the efficacy of these practices, it remains imperative to determine the extent to which these practices may be harmful. Though youth may have the best of intentions in combining these substances, there remains the possibility that such combinations may produce harmful interactions, whether acute or long-term. For example, the combination of serotonergic drugs with MDMA may potentially place users at risk for serotonin syndrome (Oesterheld et al. 2004). In addition, even if these combinations eliminate one harm—e.g. depression—they might induce another—e.g. liver damage. The safety of preloading and post-loading practices must be examined through clinical research, so as to prevent any potential harm that may unintentionally arise from these increasingly widespread practices.

As the practices of preloading and post-loading continue to spread among youth who participate in club and rave subcultures as well as beyond these milieus, they remain an important subject of inquiry for social scientists, clinical scientists, and policy analysts. Though these practices represent attempts by youth to reduce the harm associated with Ecstasy use, many of these practices remain understudied from a clinical research standpoint and for this reason should be advocated with caution. Collaborative research using field research to model these practices in the laboratory would provide the means to more fully evaluate both the efficacy and safety of these practices.

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