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Prospective Influence of Music-Related Media Exposure on Adolescent Substance-Use Initiation: A Peer Group Mediation Model

Michael D. Slater[a] and **Kimberly L. Henry**[b]

[a]The Ohio State University, School of Communication, Columbus, OH 43210-1339

[b]Colorado State University, Department of Psychology, Fort Collins, CO 80523-1876

Abstract

The present study tests prospective effects of music-related media content (from television, internet, and magazines) on youth alcohol, cigarette, and marijuana use initiation. Indirect effects via association with substance-using peers are also tested in a four-wave longitudinal data set (2729 middle-school students for the alcohol model, 2716 students for the cigarette model, and 2710 students for the marijuana model) from schools across the U.S. In so doing we examine theoretical claims regarding socialization mechanisms for effects of popular music listenership on substance-use initiation. Results supported direct effects on alcohol and cigarette uptake, and indirect effects via association with substance-using peers on all three substances. This research, in combination with prior studies by several research teams, suggests elevated popular music involvement is a risk factor with respect to younger adolescents' substance use behavior. This influence is in part explained by the role of music-related media content in socialization to substance-using peer groups.

Popular music plays a central role in the life experience of American adolescents (Arnett, 1995; Christenson & Roberts, 1998; Lull, 1985; Rideout, Foehr, & Roberts, 2009). Content analyses have documented extensive references to substance use in such music (Primack, Land, & Fine, 2008) and in music videos (DuRant, et al., 1997). Several cross-sectional surveys (Arnett, 1991; Chen, Miller, Grube, & Waiters, 2006; Forsyth, Barnard, & McKeganey, 1997; Mulder, Ter Bogt, Raaijmakers, & Vollebergh, 2007) have associated use of various genres of popular music with increased alcohol and illegal drug use. Clearly, there is reason for concern.

We argue that the influence of popular music and music-related media on adolescents' substance-use initiation a) can be identified prospectively and b) is mediated by socialization into peer groups that are oriented to substance use and likely to lead to substance-use initiation (Arnett, 1995; Catalano, Kosterman, Hawkins, Newcomb, & Abbott, 1996; Donohew, Clayton, Skinner, & Colon, 1999; Kelly & Donohew, 1999; Mulder, et al., 2010). In the present research, we use a prospective research design (with four waves of data over two years) to assess these claims.

Direct correspondence to Michael Slater, slater.59@osu.edu, 614-247-8762.

Popular Music, Adolescent Socialization, and Substance Use

Listening to popular music, alone or with friends, is one of the most ubiquitous activities of American adolescents (Rideout, Foehr, & Roberts, 2009). Such listenership has been described as central to the evolution of personal and social identity among adolescents (Arnett, 1995; Christenson & Roberts, 1998). Social identity is linked in turn to choices of peer group and substance use behavior among adolescents (Barber, Eccles, & Stone, 2001). Therefore, if much popular music implicitly endorses substance use, it is likely to influence social identity, peer associations, and substance use.

Content of popular music, music videos, and other MTV content related to substance use

Lyrics, situations, and images consonant with marijuana, alcohol, and cigarette use are frequently found on music video channels (DuRant, et al., 1997) and in popular music as a whole (Primack, Dalton, Carroll, Agarwal, & Fine, 2008). For example, Primack et al. (2008), analyzing the 279 most popular songs from 2005, reported that 93 of the songs portrayed substance (alcohol, marijuana, tobacco, or other drug) use, with only 4% communicating an anti-use message. DuRant, et al. (1997) found that over 25% of MTV music videos showed alcohol use and over 25% showed tobacco use. Youth-oriented reality programming such as *Jersey Shore* is becoming increasingly prominent on MTV. Unfortunately, content analyses characterizing substance use on such reality programming are not yet available, though news reporting documents concerns about the extent of use of substances in such programming.[1]

Substance-use consistent images and music are also widely available on the Internet (Forsyth & Malone, 2010; Ribisl, Lee, & Henrickson, 2003), though systematic research on such content is in its infancy. We therefore refer to this broad and emerging array of content —which is associated with popular music but which can include reality programming and other narrative content expressive of social and behavioral norms—as *music-related media content*, the key independent variable addressed in this study.

Evidence for effects of popular music and music videos on adolescent substance use

Previous research has prospectively linked MTV and other music video channel viewing to use of substances including tobacco (Slater & Hayes, 2010) and alcohol (Robinson, Chen, & Killen, 1998). The Slater and Hayes (2010) study examined a random sample of 2259 younger U.S. adolescents, from the National Survey of Parents and Youth (NSPY). The NSPY data set provided four waves of data over two years and parenting as well as youth variables which could be incorporated as controls. Self-reported baseline viewing of music video channels, after inclusion of controls for overall television viewing, sensation-seeking, and parental monitoring, predicted increased latent trajectories of both association with smoking peers and smoking uptake (the latter two trajectories, unsurprisingly, were correlated). The Robinson et al. (1998) study examined 1558 ninth-grade students from six schools in San Jose, California using regression analyses of two waves of longitudinal data

[1]Popular media news reports (and casual viewing) indicate that alcohol use in particular is a staple of such programming (e.g., http://www.foxnews.com/entertainment/2010/03/11/mtv-bans-jwoww-jersey-shore-drinking-alcohol/, accessed May 7, 2011)

18 months apart and found that music video viewing predicted increased alcohol use, after controlling for demographic variables and other media use.

It is possible that influence of such viewing on substance use may be primarily a function of the dramatized visuals and not of exposure to music. However, several recent lines of research have associated, in cross-sectional school samples, self-reported use of various genres of music preference (e.g., rap or heavy metal music) with increased use of both legal and illegal drugs (Arnett, 1991; Chen, et al., 2006; Forsyth, et al., 1997; Mulder, et al., 2007). Another cross-sectional study (Primack, Douglas, & Kraemer, 2010) content-analyzed the contents of the lyrics of American ninth-graders favorite songs for marijuana references and found that those in the highest tercile of exposure were nearly twice as likely to be marijuana users as those in the lowest tercile of exposure. Given the ubiquity of popular music use among young people, the implications of such findings are troubling. At the same time, causal pathways in such cross-sectional associations are inherently ambiguous. Moreover, the theoretical basis for the impact of music lyrics on substance use behavior is unclear. Unlike movies or music videos, there is no visual modeling of substance use exemplars in music.

Mechanisms for the Influence of Music and Music-Related Media on Adolescent Substance Use: An Adolescent Socialization Perspective

Socialization explanations suggest that effects of popular media content may result not only via modeling of behaviors (Bandura, 1986), but also via acquisition of new norms and attitudes consistent with those of substance-using peers (e.g., see Arnett, 1995).

Mulder, et al. (2010), for example, demonstrated that certain popular music genres were strongly associated cross-sectionally with spending time with substance-using peers and of substance use behavior. Mulder, et al. (2010) also found that associations of music use with substance use were mediated by spending time with substance-using peers. Of course, directionality is inherently ambiguous in these cross-sectional results.

The reinforcing spirals model (Slater, 2007) focuses on the dynamic role of media in socialization, arguing that adolescents use media to develop and reinforce their evolving social identities. For example, exposure to music videos provides younger adolescents a way to begin to observe and potentially adopt social identities consistent with substance-using peer groups while still at home (Slater & Hayes, 2010). Such virtual experimentation with social identities is likely to precede and encourage involvement with peer groups that embrace such identities. Similarly, prior longitudinal research has found that effects of exposure to R-rated films on smoking among adolescents were partially mediated by effects on association with smoking peers (Wills, Sargent, Stoolmiller, Gibbons, Worth, & Dal Cin, 2007). Once involved with such peer groups, adolescents will begin to seek out specific genres of music consistent with such peer group norms and preferences (see discussion in Slater & Hayes, 2010). Therefore, our focus in this research is how the selection of music-related media content in television, internet, and print media in turn influences peer group associations and substance-use initiation.

In the present study, we seek to extend existing findings in several ways. First, we extend the Slater and Hayes (2010) findings by including exposure to a variety of music-related media (music-related magazines and Internet sites as well as music video channels). This study also includes alcohol and marijuana outcomes, and seeks to replicate in a different sample and with different measures prior findings regarding influences on cigarette smoking. We extend findings of Mulder, et al. (2010) by providing, as they did, statistical tests of mediation and indirect effects via peer group use norms, but using a longitudinal instead of a cross-sectional data set to assess prospective effects of music-related content exposure. We extend longitudinal findings of Wills, et al. (2007) regarding effects of movie exposure on smoking via peer group influences to music-related media effects on several substance use outcomes. In so doing, we test identity and socialization-based explanations (e.g. the reinforcing spirals model) of the impact of music-related media content on adolescent substance-use initiation.

Accordingly, we predict:

H1. Exposure to music-related media content will prospectively predict both association with substance-using peers and initiating use of a) cigarettes, b) alcohol, and c) marijuana among younger adolescents.

H2. Significant indirect paths will be found linking exposure to music-related media content to a) cigarettes, b) alcohol, and c) marijuana initiation through the prospective effects of such media exposure on involvement with substance-using peers.

Implicit in H2 is the expectation that significant prospective relationships will be found between exposure to music-related media content and association with substance-using peers. Relationships should also be found between associating with substance-using peers and substance uptake.

Finally, to further assess the impact of such mediating relationships, we ask:

RQ1. To what extent are relationships between exposure to music-related media content and substance-use initiation attenuated by inclusion of association with substance-using peers as a mediator?

Methods

Study design

The data used in this study were obtained from the evaluation of a media-based intervention with ten communities from across the U.S. receiving a community-media intervention and ten communities serving as controls. Within each community, two middle schools were recruited and randomized to receive an additional in-school media intervention (Slater, Kelly, Stanley, Lawrence, & Comello, 2011).

Four waves of data were collected in each school during the 7^{th} and 8^{th} grade school years. A total of 3,237 students, approximately 35% of those eligible, participated in at least one wave of data collection; active parental consent and youth assent were given for such participation as required by the responsible Institutional Review Boards. Of these, 57.1%

provided data at all four waves, 27.2% provided data on three, 9.4% provided data on two and 5.3% provided data at just one of the waves. We excluded students who responded that they had tried all drugs listed including one that had been invented for the purpose of the survey—this represented no more than one percent of the students at any given wave. In this study, we focus on the subset of students who provided valid substance use data during at least one wave, this includes 2729 students for the alcohol model, 2716 students for the cigarette model, and 2710 students for the marijuana model.

Measurement

The primary outcome of interest in this study is onset of substance use, and we consider first intoxication from alcohol, cigarette smoking, and marijuana use in separate models. At each of the four waves of data collection, the students were asked if they had ever been drunk, ever smoked cigarettes, or ever used marijuana. Students responded “yes” or “no” to each item, and the responses to these items allowed us to construct a variable that represented whether or not the student had started using each substance at each wave.

We consider two primary predictors – exposure to music-related media and friends’ use of substances. The antecedent predictor is exposure to music-related media content in the form of television, magazines, and the internet at each wave. We used these indicators for several reasons. First, survey instrument space limitations precluded detailed investigation of use of various musical genres, as was done by Mulder, et al. (2010). Second, our theoretical framework emphasizes the importance of music as a form of socialization into alternative peer group norms. Increased seeking of popular music information and experience through music-related television, magazine, and internet content in our view provides a promising way to assess increasing youth involvement with peer group culture as represented by such music.

Students were asked: “About how many hours a week do you spend visiting internet sites that are about hip hop, pop, or rock music (not including music downloading)?”; “About how many hours a week do you spend looking at magazines that are about hip hop, pop, or rock music?”; “About how many hours a week do you spend watching MTV or VH1?” Students responded on a five point scale (1=none, 2=1–3 hours, 3=4–6 hours, 4=7–9 hours, 5=10 or more hours). We formed a scale by taking the mean of the three items. Cronbach’s alpha across waves ranged from .78 to .79. The lagged (w-1) measure of exposure to music-related media exposure was considered in the models. In this way, we assessed the relationship between exposure to music-related media and the onset of substance use in the subsequent wave of data collection.

The mediator of the relationship between music-related media exposure and onset of substance use considered in this study is friends’ use of substances at each wave. Students indicated how many of their friends (1=none, 2=a few, 3=most of them, 4=all of them) participate in each of the following: get drunk, smoke cigarettes, and use marijuana. Friends’ use was considered contemporaneously with onset. Cronbach’s alpha across waves ranged from .86 to .90.

Time independent controls included gender, race/ethnicity (comparing black, Hispanic, and students of some other or mixed race/ethnicity to non-Hispanic white students with three dummy-coded variables), and age at the first wave of data collection. In order to account for the nested structure of these data (i.e., students nested in schools), we also included *k*-1 dummy coded indicators of school membership (where *k* is the number of schools) as predictors in all models. This approach adjusts for all variance in the outcomes that is due to between school differences.

Time independent controls (i.e., controls measured at each wave of data collection) were included as lagged covariates in the models (i.e., measured at the same wave as music-related media exposure, *w*-1 in relation to onset of substance use).

General use of media included three parallel variables to the music-related media exposure items described above, but instead inquired about general use of internet, t.v., and magazines. Students responded on a five point scale (1=none, 2=1–3 hours, 3=4–6 hours, 4=7–9 hours, 5=10 or more hours). Cronbach's alpha across waves ranged from .69 to .70. This scale was included as a control to ensure that effects of exposure to music-related media content were not in fact due to higher levels of media use in general.

Sensation seeking was assessed with three items (e.g., "how often do you…take chances without worrying about the consequences; do exciting things, even if they are risky; do dangerous things for fun"), each item was measured on a five point scale (1=not at all, 2=not very often, 3=sometimes, 4=often, 5=very often). A two-item version of this scale has been previously validated as a predictor of substance use and as a correlate of other brief measures of sensation-seeking (Stephenson, Hoyle, Palmgreen, & Slater, 2003); the first item listed was added here to increase reliability. Cronbach's alpha across waves ranged from .83 to .90.

Family bonding was assessed with four items that inquired about how much the student felt cared for by their family. Each item was measured on a four point scale (1=not at all, 2=not much, 3=some, 4=a lot). Cronbach's alpha ranged from .83 to .88 across waves. Academic grades was assessed with a single item that inquired about the kind of grades the student receives (1=poor, 2=not to good, 3=good, 4=very good).

The lagged version of friends' use of substances (described above in the mediator section), was also included as a time-dependent control variable. Finally, time elapsed since last survey was included to adjust for any differences that may arise from a longer or shorter period elapsing between measurement waves. Due to the skew of friends' use of substances and family bonding, these variables were log transformed prior to analysis.

Table 1 presents descriptive statistics for all study variables. Table 2 presents the correlation matrix for the key variables of interest.

Analysis

Assessment of the covariates on onset of substance use was conducted using discrete-time survival analysis (DTSA) (Singer & Willett, 2003). This type of model has several attributes

that are well suited to testing the proposed hypotheses. First, DTSA consider the timing as well as the occurrence (or nonoccurrence) of the first use of substances (i.e., first intoxication, first time smoking cigarettes, first time using marijuana). Second, DTSA models right-censored data and properly accounts for the fact that many students did not initiate use during the observation period. Third, DTSA allows for the inclusion of time-dependent covariates, including our predictors of primary interest (music-related media exposure, friends' use of substances) and many of the control variables. Fourth, DTSA allows for a discrete specification of time. In our data, the initiation of substance use was measured at intervals along a time scale; therefore, we do not know the precise time when initiation occurred. Rather, we only know that it occurred within a certain time frame (e.g., between wave 3 and wave 4). For these reasons, a DTSA for the onset models was selected.

Assessment of covariates on peer use of substances was conducted using a mixed (i.e, multilevel) model where measurement occasions were nested in subjects. An unstructured covariance structure for the residuals was specified.

Proportionality is an important assumption for prediction of both onset and peer use. Specifically, covariates are assumed to have a similar effect on onset of substance use and peer use of substances across all waves of data collection (e.g., the effect of music-related media exposure at wave 1 on onset at wave 2 is similar to the effects of music-related media exposure at wave 2 on onset at wave 3). We made an a priori decision to allow the effect of time elapsed between measurement occasions to vary across waves and we tested the proportionality assumption for all other covariates (both time independent and time dependent covariates) using likelihood ratio tests. Given the large number of equality tests (69 in total), we used an alpha of .01 to determine statistical significance. Several covariates failed this assumption: sensation seeking on onset and both poor family bonding and lagged peer use on peer use for the alcohol model; lagged peer use on peer use for the cigarette model; and race/ethnicity on onset and lagged peer use on peer use for the marijuana model. Therefore, these effects were allowed to vary across waves in subsequent models.

In order to test our mediation hypotheses, we estimated two models. First, music-related media exposure and all time-dependent covariates measured at *w*-1, along with all time independent covariates, were specified to predict friends' use of substances at wave *w* using a mixed model. Second, music-related media exposure and all time-dependent covariates measured at *w*-1, friends' use of substances at wave *w*, and all time independent covariates, were specified to predict onset of each substance at wave *w* using a discrete time survival model (see Figure 1). Standard errors for the hypothesized indirect effects (mediation) were calculated using the Sobel method (Sobel, 1982). A direct effect of music-related media exposure on subsequent initiation of substance use is also considered. Because the outcome of interest in our model is binary (i.e, onset of substance use at each respective wave), we utilized a probit link function for all paths in which onset is the dependent variable. The indirect effect is better estimated with a probit rather than a logit link when the outcome is binary (MacKinnon, 2008).

As noted earlier, some students attrited during the study or missed one or more waves of data collection. To appropriately handle missing data, we employed multiple imputation.

The imputation was carried out using IVEWARE (Raghunathan, Lepkowski, Hoewyk, & Solenberger, 2001). While we chose not to impute onset of substance use because this is readily handled within the discrete time survival model (i.e., the case is censored at the point of missing data), we imputed all other covariates. Substance use and intention to use at each wave were included as auxiliary variables in the imputation. In total, 10 imputed datasets were created. All analyses were performed on each of the imputed datasets, and the parameter estimates were then combined using the procedures outlined by (Rubin, 1987).

Results

We began by estimating unconditional discrete time survival models for each substance. These models provide the hazard probabilities for onset of substance use at each wave of data collection, adjusting only for the dummy coded indicators of school membership. The hazard probability indicates the probability of initiation at wave *w*, conditional on having not already initiated at wave *w*-1 for waves 2 through 4. For wave 1, the hazard probability represents the probability of having already started using the substance at the start of the study. For alcohol intoxication onset these hazard probabilities for waves 1–4 were .04, .05, .05 and .07. For cigarette onset the hazard probabilities for waves 1–4 were .07, .06, .05, and .05 and for marijuana onset the hazard probabilities for waves 1–4 were .03, .03, .03, and .05.

Next we added music-related media exposure as a lagged predictor in each survival model along with control variables. These models estimated the direct effect of music-related media exposure on the subsequent initiation of substance use (i.e., onset at the next wave of data collection), adjusting for all control variables described in the measurement section, including overall exposure to each type of media of interest. The direct effect of music-related media exposure on onset of first intoxication from alcohol (b=.15, se=.03, p<.01) and cigarette use (b=.14, se=.04, p<.01) were both significant, indicating that, after adjusting for the controls, more music-related media exposure was associated with a higher probability of getting drunk for the first time and trying cigarettes for the first time at the subsequent wave of data collection. However, no direct effect of music-related media exposure on subsequent onset of marijuana use was found (b=.04, se=.04, *NS*) after adjustment for the control variables. Therefore, we found support for Hypothesis 1a and 1b but not 1c.

Next, we added the mediator – friends' substance use – to each survival model and also estimated the effect of music-related media exposure on peer use with a mixed model. The results of the models are presented in Figure 1. For all three substances, music-related media exposure was indirectly related to onset via friends' use of substances. That is, the indirect effect was statistically significant for all three substances, supporting Hypotheses 2a, 2b, and 2c. More specifically, music-related media exposure at wave *w*-1 was associated with having more friends who use substances at wave *w*. In turn, having more friends who use substances at wave *w* was associated with a higher likelihood of experiencing one's first intoxication, first cigarette, and first use of marijuana at wave *w*. We deemed this more theoretically appropriate than using peer use at wave *w* to predict own use at wave *w+1*, as it seemed much more plausible that associating with substance-using peers would result in

substance use concurrently or near-concurrently rather than after a lag of approximately six months.

No direct effect of music-related media exposure on marijuana onset existed before consideration of the mediator. Therefore, there is no reduction in the direct effect to assess for this dependent variable. For both alcohol intoxication and cigarette onset, however, we see a substantial reduction in the direct effect compared to the models without the mediator, per RQ1. Using the proportion of variance explained calculation recommended by MacKinnon (2008) for a binary outcome, we estimate friends' use of substances explains about 25% of the effect of music-related media exposure on first intoxication. Friends' use of substances explains about 29% of the effect of music-related media exposure on cigarette uptake.

We then conducted the same set of analyses with a modified version of the music-related media exposure variable – one that excluded the MTV/VH1 item. The purpose of this analysis was to examine the possibility that effects were due to MTV/VH1 exposure only and not the other media exposures measured. If effects were solely due to MTV/VH1 exposure, the magazine-and-internet-only music-related media exposure variable should become non-significant.

In fact, the same general pattern of results emerged, although the effect of music-related media exposure was somewhat reduced. Specifically for all three models, the total direct effect of music-related media exposure (absent the MTV/VH1 item) on onset remained similar though with slightly smaller regression coefficients than those reported above (*b*=.12, *se*=.03 for first intoxication, *b*=.10, *se*=.03 for cigarette onset, and *b*=.04, *se*=.04 for marijuana onset). The effect of music-related media exposure with MTV/VH1 removed on peer use remained statistically significant (with MTV/VH1 *b*=.03 (*se*=.004), without MTV/VH1 *b*=.02 (*se*=.004)). Finally the indirect effect of music-related media exposure on onset via peer use was reduced from *b*=.04, *se*=.01 to *b*=.03, *se*=.01 for all three models, but remained statistically significant.

Summary and Discussion

Our findings support the hypothesized direct prospective effects of music-related media exposure on associating with substance-using peers, alcohol, and cigarette uptake. Hypothesized direct effects on marijuana initiation, however, were not found once control variables were incorporated in the model, perhaps because of the smaller variability in marijuana use in our sample. As predicted, significant indirect effects of music-related media exposure on initiation of all three substances via association with substance-using peers were found.

These findings complement existing research in several respects. First, Slater and Hayes' (2010) prospective findings regarding music-related media on peer and own use are extended to alcohol and marijuana as well as replicating findings regarding cigarette uptake. Second, the measure of music-related media exposure use here includes seeking of internet sites and magazine content about popular music as well as exposure to youth culture/music-oriented television channels such as MTV and VH1. Moreover, effects remained significant

when MTV/VH1 exposure was excluded from the analytic models. As a result, we can be increasingly confident that the influence of music-related media content generalizes beyond television and beyond tobacco use alone, and cannot be explained solely by televised music videos or the reality-show content now common on MTV. Third, findings also complement the cross-sectional analyses of mediation of music exposure effects via spending time with peer users (e.g., Mulder et al., 2010), by examining effects of media exposure prospectively.

Direct effects of music-related media exposure on substance use are consistent with both socialization explanations (Arnett,1995; Christenson & Roberts, 1998; Slater, 2007) and social cognitive explanations (Bandura, 1986). Evidence for mediation of such effects via association with peers provides particular support for socialization explanations. We note that socialization and social cognitive explanations in our view are complementary and not competitive. For example, it seems likely that modeling of behaviors by exemplars in media content may lead to adoption of attitudes and perceptions of norms consistent with those behaviors. Such attitudes and normative perceptions would be likely to both support association with substance-using peers and adopting substance-use behaviors characterizing that peer group.

These findings do underscore that theorizing about effects of music-related media exposure on adolescent substance initiation benefits from consideration of socialization mechanisms. The mediating paths supported here are consistent with the reinforcing spirals model: media content led to selection of peer communication networks consistent with the norms and values implicit in that media content, thereby influencing behavior.

The measurement of music-related media exposure is a limitation as well as a strength of the present study. Seeking out popular music-related content in a variety of media is a plausible indicator of increasing involvement in such music (and by extension in substance-oriented youth culture) as part of a shifting adolescent identity. However, measurement of listenership to a wide variety of musical genres, as done by Mulder et al. (2010) would provide increased insight regarding the nature and variability of the effects of popular music, as well as greater ability to study reinforcing spirals processes. The reinforcing spirals model predicts that increased association with using peer groups also results in increasing use of media genres favored by group members. Such increased use should further reinforce identification with that peer group and predicting adoption of risk behavior characterizing members of that peer group. Tests of such reinforcing processes—not possible here—would advance understanding of the role of youth media and popular music in socialization and the etiology of adolescent risk behavior.

Prospective research, while causally less ambiguous than cross-sectional studies, is correlational and dependent on the appropriateness of statistical controls. Since overall use of each type of media is controlled, the possibility that effects are an artifact of greater overall media use can be ruled out. Similarly, it is possible that youth who are more risk-oriented are more likely to seek out arousing media stimuli as well as risk-taking peers and substance use. This explanation is unlikely given use of the sensation-seeking measure as a control. Another possibility—that youth with weaker family ties might receive less supervision and be more likely to view problematic media content and to engage in risk

behaviors—was controlled through use of the family bonding measures. Likewise, the possibility that poor academic performance might be linked to greater use of such media and to risk behaviors was addressed via statistical control. Nonetheless, the possibility of additional, uncontrolled third variable explanations cannot be excluded. Our research also addresses media impact on initiation, but not on amount of substance use after initiation.

In addition, our sample is not random, though it is unusually diverse in terms of regional representation, with 20 communities from across the United States. None, though, were from major urban centers. However, it is likely that this sample would tend to have a conservative impact on results, as the most substance-oriented genres, rap (Mulder et al. [2010]), is considered primarily an urban music form (Keyes, 2004).

Our present findings, in combination with previous research, provide an increasingly robust basis for suggesting that deepening involvement with various forms of popular music among young adolescents can be a precursor to involvement with substance-using peers and to uptake of various substances. We acknowledge that the definitive study, involving a diverse longitudinal sample and measurement of listenership to specific musical genres as well as use of other music-related media by the respondent and by peer group members, remains to be done.

Given the convergence of results between this study and a variety of others using different methods and samples, there is increasing reason for concern by parents and policymakers. It appears at least some forms of popular music and music-related media content have a role in socializing youth to substance-use initiation via involvement with substance-using peer groups.

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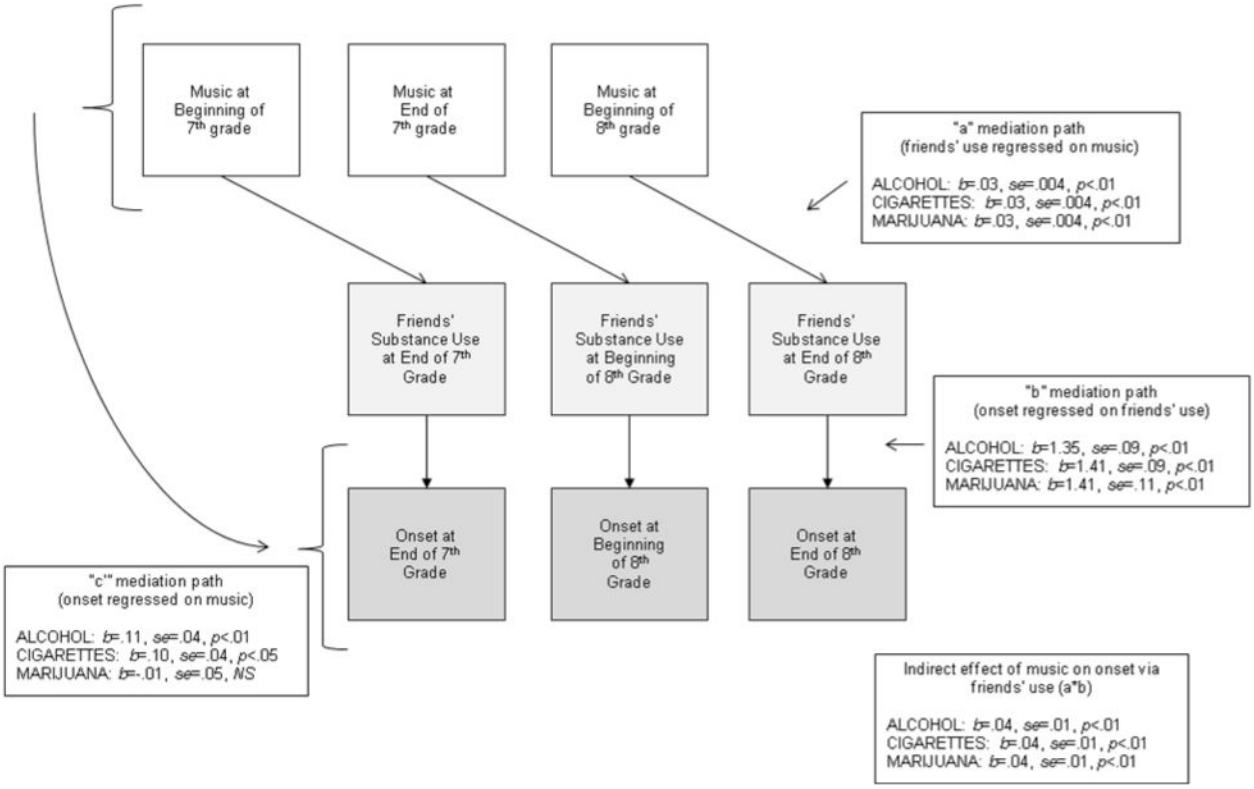

Figure 1.

Results of full mediation model.

Note: Friends' Use and Onset were regressed on all time-dependent (*w*-1) and time-independent covariates described in the measurement section. Residuals of Friends' Use were correlated across time.

Table 1

Descriptive statistics for study variables

	M/%	SD
Male %	47.37	
Age at Baseline	12.35	0.60
Non-Hispanic White %	57.51	
African American %	12.44	
Hispanic %	23.27	
Other Ethnicity %	6.77	
Onset Intoxication at or before W1 %	4.31	
Onset Intoxication at W2 %	5.51	
Onset Intoxication at W3 %	5.87	
Onset Intoxication at W4 %	8.12	
Onset Cigarette at or before W1 %	8.14	
Onset Cigarette at W2 %	6.88	
Onset Cigarette at W3 %	5.72	
Onset Cigarette at W4 %	5.39	
Onset Marijuana at or before W1 %	3.20	
Onset Marijuana at W2 %	3.75	
Onset Marijuana at W3 %	3.18	
Onset Marijuana at W4 %	5.45	
Music-Related Media Exposure W1	2.23	1.13
Music-Related Media Exposure W2	2.27	1.14
Music-Related Media Exposure W3	2.26	1.11
Music-Related Media Exposure W4	2.21	1.11
Friends' Use of Substances W1	1.21	0.45
Friends' Use of Substances W2	1.31	0.54
Friends' Use of Substances W3	1.37	0.59
Friends' Use of Substances W4	1.52	0.70
General Use of Media W1	2.47	1.01
General Use of Media W2	2.62	1.04
General Use of Media W3	2.63	1.03

	M/%	SD
General Use of Media W4	2.65	1.05
Sensation Seeking W1	2.21	0.98
Sensation Seeking W2	2.41	1.06
Sensation Seeking W3	2.51	1.13
Sensation Seeking W4	2.64	1.18
Academic Grades W1	3.35	0.65
Academic Grades W2	3.33	0.68
Academic Grades W3	3.39	0.64
Academic Grades W4	3.35	0.70
Poor Family Bonding W1	1.16	0.34
Poor Family Bonding W2	1.22	0.44
Poor Family Bonding W3	1.26	0.50
Poor Family Bonding W4	1.35	0.63
Time Elapsed W2 (in years)	0.48	0.08
Time Elapsed W3 (in years)	0.42	0.07
Time Elapsed W4 (in years)	0.54	0.11

Note: The sample for this table is restricted to students present in all three DTSA models (N=2691)

Table 2

Correlation Matrix for Key Study Variables

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1. Music W1	1.00																			
2. Music W2	**0.61**	1.00																		
3. Music W3	**0.55**	**0.61**	1.00																	
4. Music W4	**0.49**	**0.53**	**0.57**	1.00																
5. Friends' Use W1	**0.27**	**0.24**	**0.20**	**0.17**	1.00															
6. Friends' Use W2	**0.30**	**0.29**	**0.23**	**0.18**	**0.52**	1.00														
7. Friends' Use W3	**0.30**	**0.28**	**0.29**	**0.22**	**0.49**	**0.56**	1.00													
8. Friends' Use W4	**0.27**	**0.28**	**0.24**	**0.28**	**0.37**	**0.48**	**0.57**	1.00												
9. Onset Intoxication W1	**0.16**	**0.13**	**0.12**	**0.10**	**0.40**	**0.31**	**0.28**	**0.19**	1.00											
10. Onset Intoxication W2	**0.14**	**0.13**	**0.09**	**0.09**	**0.16**	**0.33**	**0.26**	**0.25**	–	1.00										
11. Onset Intoxication W3	**0.16**	**0.13**	**0.15**	**0.14**	**0.18**	**0.18**	**0.32**	**0.25**	–	–	1.00									
12. Onset Intoxication W4	**0.15**	**0.14**	**0.15**	**0.16**	**0.12**	**0.14**	**0.23**	**0.32**	–	–	–	1.00								
13. Onset Cigarettes W1	**0.17**	**0.13**	**0.12**	**0.10**	**0.45**	**0.39**	**0.36**	**0.25**	**0.42**	**0.21**	**0.18**	**0.13**	1.00							
14. Onset Cigarettes W2	**0.16**	**0.16**	**0.13**	**0.17**	**0.24**	**0.36**	**0.27**	**0.25**	**0.18**	**0.30**	**0.20**	**0.10**	–	1.00						
15. Onset Cigarettes W3	**0.08**	**0.08**	**0.14**	**0.09**	**0.15**	**0.22**	**0.35**	**0.26**	**0.06**	**0.11**	**0.26**	**0.12**	–	–	1.00					
16. Onset Cigarettes W4	**0.12**	**0.11**	**0.14**	**0.13**	**0.11**	**0.13**	**0.23**	**0.34**	0.05	**0.09**	**0.19**	**0.32**	–	–	–	1.00				
17. Onset Marijuana W1	**0.14**	**0.09**	**0.08**	**0.06**	**0.38**	**0.24**	**0.21**	**0.14**	**0.37**	**0.14**	**0.07**	**0.07**	**0.43**	0.04	0.01	0.03	1.00			
18. Onset Marijuana W2	**0.08**	**0.15**	**0.08**	**0.08**	**0.20**	**0.31**	**0.22**	**0.22**	**0.23**	**0.34**	**0.07**	0.04	**0.27**	**0.31**	**0.10**	**0.09**	–	1.00		
19. Onset Marijuana W3	**0.06**	0.01	**0.06**	**0.09**	**0.12**	**0.20**	**0.29**	**0.20**	**0.06**	**0.08**	**0.36**	0.01	**0.18**	**0.12**	**0.37**	**0.08**	–	–	1.00	
20. Onset Marijuana W4	**0.10**	**0.10**	**0.11**	**0.11**	**0.21**	**0.23**	**0.29**	**0.34**	**0.19**	**0.13**	**0.18**	**0.37**	**0.14**	**0.16**	**0.18**	**0.35**	–	–	–	1.00

Notes: The sample for this table is restricted to students present in all three DTSA models (N=2691). Bolded values are significant, $p<.05$.