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Culture and Substance Use: Music

The Soundtrack of Substance Use: Music Preference and Adolescent Smoking and Drinking

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A connection between preferences for heavy metal, rap, reggae, electronic dance music, and substance use has previously been established. However, evidence as to the gender-specific links between substance use and a wider range of music genres in a nationally representative sample of adolescents has to date been missing. In 2003, the Dutch government funded the Dutch National School Survey on Substance Use (DNSSSU), a self-report questionnaire among a representative school-based sample of 7,324 adolescents aged 12 to 16 years, assessed music preference, tobacco, and alcohol use and a set of relevant covariates related to both substance use and music preference. Overall, when all other factors were controlled, punk/hardcore, techno/hardhouse, and reggae were associated with more substance use, while pop and classical music marked less substance use. While prior research showed that liking heavy metal and rap predicts substance use, in this study a preference for rap/hip-hop only indicated elevated smoking among girls, whereas heavy metal was associated with less smoking among boys and less drinking among girls. The types of music that mark increased substance use may vary historically and cross-culturally, but, in general, preferences for nonmainstream music are associated positively with substance use, and preferences for mainstream pop and types of music preferred by adults (classical music) mark less substance use among adolescents. As this is a correlational study no valid conclusions in the direction of causation of the music–substance use link can be drawn.

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Keywords tobacco use; alcohol use; music preference; adolescents

Introduction

From early adolescence, music becomes an increasingly important aspect of youth culture (North, Hargreaves, and O'Neill, 2000; Roberts, 2000). Studies indicate a considerable amount of listening time, increasing from about an hour per day during early grade school to 3 hours or more by the end of high school (e.g., North and Hargreaves, 2003; Roberts and Christenson, 2001; Roberts and Foehr, 2001). On the contrary, the use of television shows the opposite relationship with age, averaging about 3 hours in grade school followed by a drop to around 2 hours a day by the 12th grade. Although both media are important at all ages, television can be properly called the medium of childhood, music the medium of adolescence. Popular music mirrors important life events and concerns of young people, as it regards courtship, romance, sexuality, the breakdown of relationships, and associated hurt feelings. It is an important medium with regard to different topics ranging from fashion statements to political attitudes. Music functions as an energizer, a mood enhancer, a medium that consoles and fends off boredom; it is important for the formation of knowledge of the world and, hence, identity (Christenson and Roberts, 1998; Schwartz and Fouts, 2003; Ter Bogt, 2007). Music preference is important for friendship selection, while peer groups define ingroup and outgroup through their affinity with music genres (Bakagiannis and Tarrant, 2006; North et al., 2000; Rentfrow and Gosling, 2006; Selfhout, Delsing, Meeus, and Ter Bogt, 2007).

Though, overall, music's role in adolescent lives is positive there have been comments about its supposed negative influences on young people. The potential influence of music, its lyrics and video clips, and the function of popstars as role models has raised concerns among parents and other educators, as certain types of music may play a role for the onset and continuation of adolescent substance use. As music is an important and penetrating medium for most adolescents we believe it is indeed important to study this medium in relation to substance use, specifically in a country with high to extremely high prevalences of adolescent tobacco and alcohol use (e.g., Currie et al., 2004). Several investigations have illustrated that music and music videos have come to the attention of the alcohol industry and have been used as a tool to market alcohol (Alaniz and Wilkes, 1998; Herd, 2005). However, to our knowledge there exist only a few experimental studies directly exposing causal links¹ between music exposure and, for instance, alcohol consumption (e.g., Bach and Schaefer, 1979; North and Hargreaves, 1996; North, Shilcock, and Hargreaves, 2003), indicating that the tempo of music is linked to drinking alcohol in bars and music genre to buying/ordering alcohol in shops and restaurants. Survey studies have shown that music preference is linked to substance use patterns in young people; studies in the United States have shown that heavy metal fans are more often engaged in reckless behaviours, such as drunk driving, unsafe sex, drug use, and minor criminal activity (Arnett, 1991b; Stack, Gundlach, and Reeves, 1994; Took and Weiss, 1994). Forsyth, Barnard, and McKeganey (1997) showed that rave music (aka house) was positively related with the use of all kinds of legal and illegal substances, including alcohol, among Scottish youth. A Canadian study on music genres and deviant behaviours points to the significant links between rap music

¹The reader is asked to refer to Hills's criteria for causation, which were developed in order to help assist researchers and clinicians determine if posited factors were *causes* of a particular disease or *outcomes* or *merely associated*. Hill, A. B. (1965). The environment and disease: Associations or causation? *Proceedings of the Royal Society of Medicine*, 58:295–300. Editor's note.

and deviant behaviours such as violence, aggression, soft drugs, and alcohol use (Miranda and Claes, 2004). More recent, Chen, Miller, Grube, and Waiters (2006) found that, even when controlling for an important personality factor (sensation seeking), preferences for rap, techno, and reggae were positively associated with smoking and drinking, indicating that music may have effects independent of personality characteristics that are linked to these music preferences and substance use.

However, these studies have particularly focused on music styles with deviant reputations, in particular heavy metal and gangstarap. It is thus unknown whether preference for other mainstream or nonmainstream genres is also associated, positively or negatively, with substance use. Furthermore, previous studies have included relatively small samples, frequently of college students rather than of adolescents, and the music preference–substance use link has yet to be tested in large representative samples of adolescents. Although music preference has been linked to risk behaviour and substance use in a number of English-speaking countries (United States, United Kingdom, Canada, Australia) research in other countries is scarce.

This study was conducted as part of a large national epidemiological survey study among school-going adolescents. Previous research has shown that preferences for loud, energizing types of music are related to the quality of the relationship with parents and peers (negatively), peer and parental substance use (positively), and school level and school achievement (negatively) and that fans of these types of music more often stem from single parent families (Arnett, 1991a, 1991b; Roe, 1985, 1992, 1995; Took and Weiss, 1994; Weinstein, 2000). This same set of characteristics has been shown to be related to substance use in other (Dutch epidemiological) studies (Monshouwer *et al.*, 2006; Petraitis, Flay, and Miller, 1995; Verdurmen, Monshouwer, Van Dorsselaer, Ter Bogt, and Vollebergh, 2005). In the Dutch National School Survey on Substance Use (DNSSSU) the importance of music preferences for alcohol and tobacco use was assessed, controlling for factors such as household composition and relationship with parents, school achievement, and perceived parental and peers' substance use. Analyses were run separately for both genders, as previous studies have shown not only gender-based differences in preferences of musical genres (Christenson and Peterson, 1988) but also the genres' differential associations with substance use. In sum, the current study entails (1) an exploratory effort to test the links between a wide range of musical genres and substance use, in (2) a large nationally representative sample of adolescents while (3) including a set of relevant covariates of substance use and music preference as confounders, in (4) a non-English-speaking country known for its high substance use among adolescents.

Method

Sample

The data were derived from the 2003 DNSSSU, a cross-sectional study conducted every 4 years since 1984 that is supported by the Dutch Ministry of Health, Welfare and Sport. The sample was obtained by using a two-stage random sampling procedure from all secondary schools in the Netherlands. Schools were stratified according to level of urbanization and drawn proportional to their number in the corresponding urbanization level. Within each school, a maximum of five classes (depending on school size) were randomly selected. The 10-, 11-, 17-, and 18-year olds were excluded, because at these ages school students are not representative for the Dutch adolescent population; some of the 10- and 11-year olds are still receiving primary education, and some of the 17- and 18-year olds have

already left school. (In the Netherlands school is compulsory up to age 16.) The resulting sample comprised 7,324 students (mean age 13.91 years). The school response rate was 72% (192 out of 268 schools). Nonresponse mainly had to do with participation in other researches (65%). Responding and nonresponding schools did not differ on urbanization level or school size. Within classes an average of 7% of the students were not included, primarily due to illness. Parents were informed of the topic of the study and were free to indicate whether they wanted their children to participate in this study through a letter or an e-mail (passive consent). No single parent objected to having his/her child interviewed.

Data Collection

The DNSSSU is a survey that targets substance use and its correlates among adolescents in the Netherlands. The question format is derived from other large-scale investigations into substance use such as European School Survey Project on Alcohol and other Drugs (ESPAD; Europe), Health Behaviour in School-Aged Children (HBSC; Europe and United States), and Monitoring the Future (United States). Student data were collected by questionnaire, administered in regular classes by trained assistants. These assistants briefly introduced themselves and the study and asked the students to answer the questions as best as they could. They stressed the anonymity of the process. Questionnaires did not ask for the names of students. After students finished answering, the questionnaires were collected and put into an envelope that was sealed in front of their eyes. Teachers were asked to leave or take a place at the back of the classroom.

Measures

Music preference was assessed using eight music genres that pupils could each rate on 5-point scales ranging from 1 (“dislike strongly”) to 5 (“like very much”), with a separate option for “don’t know this type of music” (Ter Bogt, Raaijmakers, Vollebergh, Van Wel, and Sikkema, 2003). The presented genres were representative of the scope of music available across Europe and North America (Christenson and Peterson, 1988; Mulder, Ter Bogt, Raaijmakers, and Vollebergh, 2006; Ter Bogt et al., 2003; Tillekens, 1993); i.e., they included chart-based pop music (the Dutch top 40 pop songs), the popular Afro-American music (rap/hip-hop), an Afro-Caribbean genre (reggae), two genres from the rock spectrum (heavy metal and punk/hardcore), two forms of dance music (house/trance and techno/hardhouse), and classical music. Missing scale item values were substituted using the relative mean substitution approach (Raaijmakers, 1999).

Outcome Measures

Prevalence of cigarette smoking was assessed by asking students the number of times they had smoked cigarettes during the past month. Answers were recoded, resulting in two categories: “never” and “used once or more.” *Prevalence of alcohol consumption* was assessed in the same way.

Covariates

School level was represented by four categories ranging from the lowest (prevocational) to the highest (preuniversity) level of education. This variable was recoded into dummy

variables based on these categories, and the latter was taken as the reference category. *School achievement* (perceived) was assessed on a scale ranging from 1 (“very well”) to 5 (“very unsatisfactory”). These were dummy recoded with the first category as the reference. *Household composition* was dichotomized into 1 (“living with both biological parents”) and 0 (“otherwise”). *Support from parents and friends* was perceived support from father, mother, and best friend (Settertobulte, 2000). One of the question asked was “How easy is it for you to talk to the following persons about things that really bother you?” with the response categories “very easy,” “easy,” “difficult,” “very difficult,” and “don’t have or see this person.” The five answer categories were recoded into three dummies “high support” (which was the reference), “low support,” and “don’t have or see this person.” *Perceived parental substance use* was assessed by asking, “Does your father or mother ever do the following things?” with separate scales for father and mother that included “never,” “now and then,” “every week,” “every day,” “will not or cannot answer” for cigarette smoking and drinking alcohol. Categories were dummy recoded with the first category being used as the reference category. *Peer substance use* (perceived) was assessed by asking, “How many of the boys and girls you hang out with drink alcohol/smoke cigarettes at least once a week?” with the options “none,” “a few,” “half,” “most,” and “all.” These categories were dummy recoded with the first category as the reference group.

Preliminary Analyses

Before running multivariate logistic regression models, the bivariate correlations between the music preference scales and the covariates were examined, as were multicollinearity diagnostics from linear regression models within Statistical Package for Social Sciences (version 12.0.2). Correlations between music preference scales varied between -0.12 and 0.63 , while correlations between preference scales and the covariates varied between -0.08 and 0.21 . Colinearity diagnostics showed tolerance statistic values over 0.49 and VIF values below 1.99 . Multicollinearity was therefore not considered a problem.

Analyses

The two-stage random sampling procedure had to be taken into account in the analysis. First, students from the same school were drawn as a cluster. A cluster sample will not affect point estimates such as prevalence rates, but it does affect variance-related estimates. In order to obtain correct 95% CIs and p values, robust standard errors were obtained via the Huber/White/Sandwich method (Stata Corporation).

Multivariate logistic regression models were run for both alcohol and tobacco use. Model 1 included the music variables and substance use. Model 2 tested, by gender, the predictive power of music preference when controlling for confounders, i.e., age, household composition, school level, school achievement, perceived peer and parental substance use, and perceived support from mothers, fathers, and best friends. For all models, the odds ratios (ORs), and confidence intervals (CIs), are presented, plus the associated Nagelkerke’s R^2 values, as an approximation of the level of explained variance.

Results

Descriptives

Table 1 displays differences in appreciation of the musical genres. Boys and girls differ in their music taste (t tests, $p < .001$). Among girls, chart-based pop music is the most

Table 1
Music preferences by gender, age and educational level

	Pop	Rap/ Hip-Hop	Heavy metal	Punk/ Hardcore	House/ Trance	Techno/ Hardhouse	Reggae	Classical music
Gender								
Girls	4.0 ¹	3.6	2.3 ¹	2.6 ¹	3.1 ¹	2.5 ¹	2.9	2.0 ¹
Boys	3.5 ²	3.6	2.6 ²	2.9 ²	3.4 ²	3.0 ²	2.8	1.8 ²
Age								
12	3.8 ¹	3.7 ¹	2.6 ¹	2.9 ¹	3.4 ¹	2.9 ¹	2.8	2.0 ¹
13	3.8 ^{1,2}	3.7 ¹	2.5 ^{1,2}	2.8 ¹	3.2 ^{1,2}	2.7 ^{1,2}	2.8	1.8 ²
14	3.7 ^{1,2}	3.7 ¹	2.4 ^{2,3}	2.8 ^{1,2}	3.2 ²	2.7 ²	2.8	1.9 ^{1,2}
15	3.7 ^{1,2}	3.6 ^{1,2}	2.2 ³	2.6 ²	3.2 ²	2.7 ²	2.8	1.9 ^{1,2}
16	3.6 ²	3.4 ²	2.1 ³	2.5 ²	3.1 ²	2.6 ²	2.9	2.1 ¹
Education								
Low	3.7 ¹	3.7 ¹	2.4	2.8	3.4 ¹	2.9 ¹	2.8	1.7 ¹
Low/Mid	3.8 ²	3.8 ¹	2.4	2.8	3.3 ¹	2.8 ²	2.8	1.8 ²
Mid/High	3.8 ²	3.6 ²	2.4	2.7	3.1 ²	2.6 ³	2.8	2.0 ³
High	3.9 ³	3.5 ³	2.4	2.7	3.0 ³	2.4 ⁴	2.9	2.2 ⁴

Mean scores, Likert scales 1 'dislike this music strongly' – 5 'do like this music very much'

Different superscripts indicate differences between boys and girls, age groups and educational levels, respectively (t-tests, ANOVAs, $p < .001$)

popular music with rap/hip-hop also being highly preferred. Girls do not particularly like or dislike genres such as house/trance and reggae, while they generally do not appreciate punk/hardcore, techno/hardhouse, and particularly heavy metal and classical music. Among boys rap/hip-hop is the most popular music followed by chart-based pop and house/trance. They do not particularly like or dislike punk/hardcore, techno/hardhouse, and reggae but generally dislike heavy metal and particularly classical music. Gender differences emerged for pop and classical music, which were more popular among girls, whereas metal, punk/hardcore, house/trance, and techno/hardhouse were more popular among boys. Overall, girls prefer music that is melodic and mainstream (pop) or melodic and sophisticated (classical music), while boys tend to prefer noisy (metal, punk/hardcore) or highly energetic genres (house/trance, techno/hardhouse).

Next, age differences were uncovered (ANOVAs, $p < .001$). The popularity of pop music's heart, chart music, declines somewhat during the period from 12 to 16 years. The same holds for rap/hip-hop, house/trance and techno/hardhouse, while a relatively substantial drop in popularity was found for heavy metal and punk/hardcore. Thus, loud rebellious music seems to be particularly popular in early adolescence among boys. The only exception to this downward trend in popularity is classical music. Its popularity forms a U-shaped curve, with classical music being relatively popular among 12- and 16-year olds and lower affinity scores in between.

Month prevalence of smoking cigarettes is 21.5% for girls and 16.5% for boys. Month prevalence of drinking alcohol is 55% for girls, and 57.6% for boys.

Tobacco Use

Table 2 illustrates the two models for both girls and boys. For girls, in model 1, the model with only music preferences as predictors, liking pop or classical music is negatively associated with smoking (OR 0.66–0.75), while liking rap/hip-hop, reggae, house/trance, and techno/hardhouse is positively associated with smoking (OR 1.14–1.34). In the second model, appreciation of rap/hip-hop no longer predicts smoking, but house/trance, techno/hardhouse and reggae are positively associated with tobacco use and pop and classical music negatively, even when all other variables are controlled (O.R's 0.82–1.21). Nagelkerke's R^2 values for the two models are 0.12 and 0.47, respectively.

For boys, in the first model liking pop, heavy metal, house/trance, and classical music is negatively associated with smoking (OR 0.66–0.86). Liking punk/hardcore, techno/hardhouse, and reggae is positively associated with tobacco use (OR 1.26–1.36). In model 2 the same pattern applies, except that preference for house/trance is no longer significantly associated with smoking (OR 0.76–1.29). Nagelkerke's R^2 values for the two models are 0.13 and 0.44, respectively.

Thus, music preferences significantly and substantially mark tobacco use with effects that can be qualified as medium (Cohen, 1988). Introducing confounders in the models considerably raises the level of explained variance, and most links between music preferences and tobacco use remain significant, indicating that music's association with tobacco use is only partly explained by the effects of these covariates.

Alcohol Use

Table 3 shows that among girls a preference for classical music and heavy metal is negatively associated with last-month drinking (OR 0.81–0.83), while preference for punk/hardcore, house/trance and reggae is positively associated with alcohol use (OR 1.15–1.30). Adding the confounders results in the same pattern of associations, except that heavy metal is no longer a significant predictor (OR 0.80–1.31). Nagelkerke's R^2 values for the two models are 0.08 and 0.46, respectively.

For males a preference for pop, rap/hip-hop, and classical music is associated negatively with alcohol use (OR 0.88–0.93), while preferring punk/hardcore and techno/hardhouse is associated positively with drinking (OR 1.19–1.23). When controlling for confounders the associations with preference for chart-based and rap/hip-hop are no longer significant, but a significant negative association between classical music and alcohol use remains, next to positive associations with punk/hardcore and techno/hardhouse (OR 0.87–1.18). Nagelkerke's R^2 values for the two models are 0.07 and 0.41, respectively.

Again, music preferences significantly and substantially mark alcohol use with effects that can be qualified as medium (Cohen, 1988). Once more, controlling for other variables considerably increases the level of explained variance; however even in the full model music preferences predict alcohol use significantly, indicating that music's association with alcohol use is only partly explained by the effects of these covariates.

Mediation

In the first model music preferences are significantly associated with substance use, with medium effect sizes in the 7%–12% range (Cohen, 1988). Introducing background characteristics, quality of parent and peer relationships, and perceived peer use both increases the explanatory power of the second model to between 41% and 47% and decreases the OR

Table 2
Logistic regression analysis: music preference and last month tobacco use

	Girls				Boys			
	Model 1		Model 2		Model 1		Model 2	
	Music preferences	Music preferences + background characteristics + number of peers smoking	OR	95% CI	Music preferences	Music preferences + background characteristics + number of peers smoking	OR	95% CI
Chart-based	0.66***	0.60–0.72	0.83**	0.73–0.94	0.66***	0.60–0.73	0.76***	0.67–0.85
Rap/Hip Hop	1.16***	1.06–1.26	—	—	—	—	—	—
Heavy Metal	—	—	—	—	0.79***	0.73–0.87	0.90*	0.81–1.00
Punk/Hardcore	—	—	—	—	1.32***	1.21–1.45	1.25***	1.11–1.39
House/Trance	1.24***	1.13–1.36	1.21**	1.09–1.35	0.86**	0.77–0.95	—	—
Techno/Hardhouse	1.34***	1.24–1.45	1.15**	1.04–1.28	1.36***	1.22–1.50	1.29***	1.13–1.46
Reggae	1.14**	1.04–1.24	1.13*	1.01–1.25	1.26***	1.15–1.37	1.14*	1.03–1.27
Classical music	0.75***	0.69–0.82	0.82***	0.73–0.91	0.76***	0.68–0.85	0.85*	0.74–0.98
Nagelkerke'S R ²	0.12		0.47		0.13		0.44	
Model improvement ^a	292.73 (df = 6, p = .000)		1245.79 (df = 23, p = .000)		241.57 (df = 7, p = .000)		890.26 (df = 23, p = .000)	
N	3694		3470		3167		2935	

*** $p < .001$, ** $p < 0.01$, * $p < 0.05$

^a χ^2 measuring change in -2 log-likelihood from the previous model

Table 3
Logistic regression analysis: Music preference and last month alcohol use

	Girls				Boys					
	Model 1		Model 2		Model 1		Model 2			
	Music preferences	95% CI	Music preferences + background characteristics + number of peers smoking	OR	95% CI	Music preferences	95% CI	Music preferences + background characteristics + number of peers smoking	OR	95% CI
Chart-based	—	—	—	—	—	0.9**	0.84–0.97	—	—	—
Rap/Hip Hop	—	—	—	—	—	0.93*	0.87–0.98	—	—	—
Heavy Metal	0.83***	0.76–0.9	0.94	0.85–1.05	—	—	—	—	—	—
Punk/Hardcore	1.30***	1.21–1.41	1.14*	1.03–1.26	1.19***	1.11–1.28	1.18***	1.08–1.3	—	—
House/Trance	1.26***	1.19–1.34	1.31***	1.21–1.42	—	—	—	—	—	—
Techno/Hardhouse	—	—	—	—	1.23***	1.15–1.31	1.16***	1.08–1.26	—	—
Reggae	1.15***	1.07–1.23	1.15**	1.05–1.25	—	—	—	—	—	—
Classical music	0.81***	0.76–0.87	0.80***	0.73–0.88	0.88**	0.82–0.95	0.87**	0.80–0.96	—	—
Nagelkerke's R ²	0.08		0.46		0.07		0.41			
Model improvement ^a	209.22 (df = 5, p = .000)		431.92 (df = 21, p = .000)		152.55 (df = 6, p = .000)		1036.75 (df = 20, p = .000)			
N	3594		3383		3057		2854			

*** = $p < .001$, ** = $p < 0.01$, * = $p < 0.05$

^a χ^2 measuring change in -2 log-likelihood from the previous model

associated with music preferences to a certain extent, though music still predicts substance use significantly in most cases. The preliminary analysis showed that music preferences are associated with (perceived) peer use, and in the model this emerged as the strongest predictor of tobacco and alcohol use (not reported in Tables 2 and 3). As both music preferences and, even more so, peer use are clearly linked to substance use and as the introduction of peer use in the analysis decreases the OR's related to music preference, mediation is indicated (Baron and Kenny, 1986). More precisely, peer substance use *partly* mediates the link between music preferences and alcohol and tobacco use, as the significant model 2 music preference ORs indicate that there is a residual direct effect of music on substance use. Reversing the order of introduction of the variables in the models with all covariates first and then music preferences showed that the increment in the explained variance linked to this residual effect is still 2%–5% (not reported in Tables 2 and 3).

In sum, music preferences are significantly and substantially linked to substance use; the link between music preferences and substance use is partially mediated by peer use, and a direct predictive effect of music on substance resides even when all other variables, including peer use, are controlled.

Discussion

This study aimed at assessing the importance of a wide range of music genre preferences for adolescent tobacco and alcohol use in a nationally representative sample while controlling for factors that have been shown to be relevant for both music preferences and substance use. Overall, when confounders are controlled, punk/hardcore, techno/hardhouse, and reggae are associated with more substance use, while pop and classical music mark less substance use. Heavy metal preference indicates less drinking among girls and less smoking among boys. For girls a rap/hip-hop preference is associated with more smoking, but no relation to substance use was found for boys. Among girls liking house/trance indicates more smoking, but among boys liking house/trance was associated negatively with smoking with no relation to drinking.

Our results corroborate earlier studies in which music preference emerged as a predictor of substance use (Arnett, 1991b; Chen et al., 2006; Forsyth et al., 1997; Miranda and Claes, 2004; Roe, 1995). The music variables alone account for 7%–13% of the variance in substance use, indicating that music preference is a relevant factor for modeling substance use. In models in which confounders such as gender, age, household composition, quality of relations with parents and peers, and perceived parent and peer substance use are controlled, music still accounts for 2%–5% of the explained variance. Hence, music's effect is partly explained by the social composition of groups of fans and by covarying factors such as parent and peer substance use.

We found particular evidence for a mediation role of peer use in the link between music preferences and tobacco and alcohol use. Prior research has shown that music is an important conversation topic in situations in which strangers meet and that the disclosure of music taste is perceived an indicator of personality (Rentfrow and Gosling, 2006). In early phases of friendship music is relevant for bringing people closer (Bakagiannis and Tarrant, 2006; Selfhout et al., 2007). Young people with certain music tastes may not only seek others with the same taste patterns, but they may also end up with friends that smoke and drink more or, for that matter, less, as music taste is linked to peer substance use. Peer substance use, in turn, may drive the onset or continuation of smoking and drinking. However, different conceptualizations of these links are possible. Other researchers have convincingly argued

that peer substance use is a factor for choosing or rejecting friends (e.g., Kandel, 1978), and these friends may be of importance for the (further) development of music taste, as group membership solidifies taste (Tarrant, 2002; Tarrant, North, and Hargreaves, 2001). As our study is exploratory in nature and does not entail a sketch of the longitudinal trajectory of music taste and substance use development it is impossible to reach any further conclusions on the nature and timing of these associations. We can conclude, however, that, since even in the full models music remained significantly associated to substance use, music's role in the explanation of substance use cannot be entirely explained by the social composition of groups of fans or mediation through, particularly, peer substance use.

Previous research has identified a positive association between loud, "defiant" music and substance use and tried to explain this association by pointing out the utility of both rebellious music preferences and substance use for adolescents who feel like revolting against authority, are inclined to sensation seeking, or want to project a grown-up image (e.g., Arnett, 1991b, 1996; Chen et al., 2006; Forsyth et al., 1997; Roe, 1995; Stack et al., 1994; Took and Weiss, 1994; Weinstein, 2000). Earlier research has therefore focused on brash, energetic music with a lyrical content that may shock parents, teachers, and other adults: heavy metal and the defiant hip-hop music known as 'gangstarap.' In this study, other types of music surfaced as overall risk factors for smoking or drinking: punk/hardcore, techno/hardhouse, and reggae. While these genres widely differ musically, as punk/hardcore lies within the rock spectrum with techno/hardhouse being electronic dance music and reggae an offspring of Afro-Caribbean music, all of them have a certain "off-mainstream" appeal in common.

Techno/hardhouse music can be characterized as fast and minimalist, due to a monotonous bass beat, few, if any lyrics, and an exclusively electronic sound. It is at the extreme of loud and energetic dance music, typically favored more by males. Punk/hardcore is a loud and oppositional form of rock music, sometimes with a heavy politically radical touch; yet it also appears in a somewhat polished version on the charts and even there remains oppositional, at least in image. Reggae has historically been associated with Jamaican social-religious opposition but has been popularized worldwide. The term reggae hints at a subculture, known for glorifying marijuana as a means to gaining "knowledge." Overall, it seems that genres with nonmainstream, youth-oriented pop appeal attract listeners who are also more likely to consider behaviors such as smoking and drinking "cool" (Spijkerman, Van den Eijnden, and Engels, 2005), while liking for music that is either mainstream (pop) or adult-oriented (classical music) seems to buffer tobacco and alcohol use. Personal characteristics such as rebelliousness, recklessness, and sensation seeking may be the basis for attraction to both nonmainstream music and smoking and drinking. As personality factors were not included in our study we were unable to test the hypothesis that these associations were further explained by a characteristic such as recklessness, rebelliousness, or sensation seeking.

Surprisingly, the genres most conspicuous in the previous literature, i.e., heavy metal and rap/hip-hop, were not of marked importance here. Though rap/hip-hop was linked to more tobacco use among girls, it was negatively associated with alcohol use among boys, and heavy metal also predicted less smoking and drinking for boys and girls, respectively. This may hint at cross-national differences in the association between substance use and music or may reflect an international tendency toward the "softening" of metal and rap and the advent of other "nonmainstream," "defiant," "rebellious" genres. Across Europe one type of heavy metal music has gained immense popularity. With the ascent of gothic rock in the late '90s, which is solidly founded in male-oriented metal but mostly has female singers

and includes fairy-tale images and occult symbols of a vaguely medieval nature, metal has gained a large fan base among females and has increasingly appeared on the charts. In Europe metal may have lost some of its rebellious status and may therefore be a less likely music choice for adolescents who want to use their music or substance use as markers of independence. In our study, liking heavy metal was associated with less substance use for both boys and girls. Rap/hip-hop also appears to have lost its hardcore, oppositional nature since its massive popularization and seems to be less related to deviant behaviors and substance use than it was during the 1990s. We found that only for girls a preference for rap/hop-hop is positively associated with more tobacco use; for boys liking this genre is negatively linked to alcohol use.

This study "hints" at the emergence of cross-cultural historical changes in the types of music that adolescents perceive as nonmainstream and the subsequent emergence of newer forms of association between music and tobacco and alcohol use. While heavy metal and (gangsta)rap prevailed in the '80s and '90s, since then preference for other nonmainstream music, punk/hardcore, techno, and reggae, has (also) become more prominently associated with substance use (see Chen et al., 2006), while appreciating other musical genres, pop and classical music, marks lower substance use.

Study's Limitations and Conclusions

The first limitation of this study is that it relies on self-reports. Adolescents may give a biased account of their smoking and drinking, as their recall of last-month substance use is not exact, or they may not want to respond to questions about unhealthy or illegal behavior. However, questionnaires were administered in classrooms, and it was clear that anonymity was assured; this may help to generate reliable and valid data (Smit, De Zwart, Spruit, Monshouwer, and Van Ameijden, 2002). Second, limited measures of music preference were used; we did not account for the listening frequency of different types of music or address their lyrical content. Whereas music taste is possibly best conceptualized as a patterning of different choices, we relied on the analysis of single variables. Third, other important potential factors for adolescent substance use, related to music preference, such as personality characteristics (e.g., rebelliousness, recklessness, sensation seeking; Arnett, 1991b, 1992; Chen et al., 2006), social factors (like social alienation; Roe, 1995), and media influences (artists, lyrics, and music videos as modeling agents; e.g., Brown and Witherspoon, 2002; Robinson, Chen, and Killen, 1998; Wakefield, Flay, Nichter, and Giovino, 2003) have not been included in the design of this study. That leaves the possibility that the relationships that have been found can be explained in more detail by the variables that have been omitted. Finally, this study has a cross-sectional design; therefore inferences on causal relationships cannot be made.

In the modeling of adolescent substance use, peer use is a major factor (Petraitis et al., 1995). Since friends are likely to share both music taste and substance use behaviors, it would be interesting to model the structural relationships between these factors in more detail. Both music choice and substance use may drive the choice of friends, and as entwined factors music preference and peer substance use may influence the initiation or continuation of tobacco and alcohol use in a group that just has started experimenting with substances that may cause serious health problems. Moreover, longitudinal cross-national monitoring of music preferences, their associations with different types of substance use, and the patterning of peer use would allow further insight into the role of music preference in the

onset and continuation of substance use across cultures. As music is a pivotal element of adolescent culture, the study of music's function in relation to (peer) substance use seems timely. Most important, future studies should try to uncover *why* some types of music may be associated with mitigating substance use while other types of music with propagating it.

RÉSUMÉ

La corrélation entre une prédilection pour le heavy metal, le rap, le reggae, la musique de danse électronique et l'abus des substances aptes à provoquer une dépendance avait déjà été démontrée. En revanche, il n'y a jamais eu de données scientifiques recueillies à l'échelle nationale et parmi une tranche représentative d'adolescents tendant à prouver qu'il y avait un lien genre-spécifique entre la toxicomanie et une sélection plus ample de genres musicaux. En 2003, le gouvernement a subventionné une enquête nationale menée dans les écoles concernant l'usage de drogues, la Dutch National School Survey on Substance Use (DNSSSU), au moyen de questionnaires à remplir par une tranche représentative de 7.324 adolescents âgés de 12 à 16 ans, en scolarité, à qui on a demandé d'indiquer leurs préférences en matière de musique et leurs habitudes sur le plan de la consommation de tabacs et d'alcool, ainsi que divers autres variables qui ont une incidence tant sur les préférences musicales que sur l'abus de stimulants. D'une manière générale et après un recoupement de tous les facteurs, il s'est avéré que des genres tels que le punk/hardcore, le techno/hardhouse et le reggae pouvaient être associés avec une consommation plus élevée alors que la musique pop et la musique classique correspondaient à une consommation nettement plus faible. Alors que études antérieures avaient révélé que le fait d'apprécier le heavy metal et le rap tend à être un signe ou sinon le présage d'abus de substances, la présente enquête permet seulement de conclure qu'une préférence pour le rap/hip hop correspond à un tabagisme plus élevé parmi les filles alors que le heavy metal peut être mis en rapport avec une catégorie de garçons qui fument moins et de filles qui consomment moins de boissons alcoolisées. Les genres de musique qui dénotent une consommation accrue de stimulants peuvent varier en fonction de facteurs historiques et culturels, mais, en général, une préférence marquée pour les genres musicaux à contre-courant des goûts prédominants laissent supposer un usage plus fréquent de substances pouvant engendrer une dépendance alors qu'une prédilection pour la musique pop et les genres que les adultes affectionnent (la musique classique) tendent à suggérer une plus grande abstinence parmi les adolescents. S'agissant en l'occurrence d'une étude de pédagogie correctionnelle, aucune conclusion valable ne saurait être tirée permettant de dégager le rapport de causalité au niveau du lien entre la musique et l'abus de substances.

RESÚMEN

Estudios en el área han establecido el vínculo entre la preferencia musical por el *heavy metal* (o rock pesado), el *rap*, el *reggae*, la música electrónica *dance*, y el uso de sustancias. Sin embargo, a la fecha no existen en Holanda estudios en poblaciones por género en los que se analicen relaciones entre el uso de sustancias y la predilección por distintos géneros musicales.

En 2003 el gobierno de los Países Bajos lanzó la DNSSSU - o 'Encuesta Nacional de Escuelas sobre Uso de Sustancias'-, una encuesta/cuestionario que se aplicó a una muestra

representativa compuesta por 7,324 adolescentes entre los 12 y 16 años de edad. Esta encuesta analiza las preferencias musicales, el uso de alcohol y tabaco, y una serie de covariables relacionadas simultáneamente al uso de sustancias y a la preferencia musical de los entrevistados. De forma general, y cuando todos los factores han sido controlados, el *punk/hardcore*, el *techno/hardhouse* y el *reggae* muestran una asociación marcada con el uso de sustancias, mientras que en el caso del *pop* y la música clásica esta asociación es mucho menor. Estudios anteriores muestran la asociación entre la predilección por el *heavy metal* y el *rap* al uso de sustancias. No obstante, la preferencia por el *rap/hiphop* en estos estudios está asociada únicamente al incremento en el uso de tabaco en niñas, mientras que el *heavy metal* se asocia con un decrecimiento en tabaquismo entre niños, y un decrecimiento en el uso de alcohol en niñas. El vínculo que se establece entre los diferentes géneros musicales al uso de sustancias depende en gran medida de variaciones interpretativas históricas e inter-culturales. Sin embargo, y de manera generalizada, mientras que la predilección por la música alternativa tiende a estar positivamente vinculada a la propensión al uso de sustancias, la preferencia por la música *pop* y la música generalmente preferida entre adultos (música clásica) por lo contrario, parece inducir en menor grado el uso de sustancias entre adolescentes.

Este estudio es de tipo correccional, por lo que no se pueden derivar de él conclusiones en relación a la causación de la música con el uso de sustancias.

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