

Adolescents' Music Preferences and Personality Characteristics

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Abstract

The present paper examined the structure of Dutch adolescents' music preferences, the stability of music preferences and the relations between Big-Five personality characteristics and (changes in) music preferences. Exploratory and confirmatory factor analyses of music-preference data from 2334 adolescents aged 12–19 revealed four clearly interpretable music-preference dimensions: Rock, Elite, Urban and Pop/Dance. One thousand and forty-four randomly selected adolescents from the original sample filled out questionnaires on music preferences and personality at three follow-up measurements. In addition to being relatively stable over 1, 2 and 3-year intervals, music preferences were found to be consistently related to personality characteristics, generally confirming prior research in the United States. Personality characteristics were also found to predict changes in music preferences over a 3-year interval. Copyright © 2007 John Wiley & Sons, Ltd.

Key words: music preferences; Big-Five personality characteristics; latent growth curve modelling; Dutch adolescents

INTRODUCTION

Over the last decades, researchers have shown interest in people's musical preferences as an individual difference variable that relates to personality traits (Cattell & Anderson, 1953; Dollinger, 1993; Little & Zuckerman, 1986; McCown, Keiser, Mulhearn, & Williamson, 1997; Robinson, Weaver, & Zillmann, 1996). Some support has been found for the notion that people prefer listening to music that reflects specific personality characteristics (Rentfrow & Gosling, 2003; Schwartz & Fouts, 2003). However, the picture emerging from this research is incomplete since most studies have collected data at only one time-point. As a result, little is known about the stability of music preferences over

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time as well as about the way personality characteristics influence over-time changes in music preferences. Additionally, most studies on the personality correlates of music preferences have used samples of American university students. It is unclear to what extent results from these studies generalise to other age groups (e.g. adolescents) living in other cultures or countries. The aim of the present paper was to address these empirical gaps by longitudinally examining personality characteristics and music preferences in a sample of Dutch adolescents. The present study is intended to contribute to our understanding of the associations between personality and behaviour that occurs in everyday life, an area regarded to be overly neglected by personality psychologists (see e.g. Funder, 2001; Rentfrow & Gosling, 2003; Rozin, 2001).

Music plays an important role in the social and personal lives of people young and old. Estimates of annual sales in the United States, for example, put the popular music market at \$10 billion for 1993 and at over \$12 billion for 1994 (Schwartz & Fouts, 2003). More recent reports still show physical sales figures of over \$12 billion for 2005, whereas, at the same time, digital downloading of music has increased vastly over the last couple of years (Recording Industry Association of America, 2006). Of all age groups, adolescents can be considered to be the most fanatic music adepts (Christenson & Peterson, 1988; Schwartz & Fouts, 2003). North, Hargreaves, and O'Neill (2000) reported British adolescents to listen to music for an average of 2.45 hours per day. Earlier estimates indicate that, from 7th to 12th grade, American adolescents average 10500 hours of elected exposure to popular music (Zillman & Gan, 1997). The times spent listening to music approximate those spent in the classroom from kindergarten through high school. Although there is comparatively little data from other countries, studies with Irish (Fitzgerald, Joseph, Hayes, & O'Regan, 1995), Swedish (Bjurström & Wennhall, 1991) and Dutch (Ter Bogt, 2000) adolescents confirm that music is of central importance in the lives of most young people.

Personality and music preferences

Although adolescents generally share a fascination for music, adolescents differ in their preferences for musical styles. Social factors such as ethnicity, social class (e.g. Frith, 1981; Gans, 1974), youth cultures, as well as individual factors (e.g. personality, physiological arousal, social identity) have been proposed to account for the heterogeneity of adolescents' music preferences (Rentfrow & Gosling, 2003; Zillman & Gan, 1997). One line of research has focused on the role of personality traits in the determination of adolescents' musical taste (e.g. Dollinger, 1993; Little & Zuckerman, 1986; McCown et al., 1997; Pearson & Dollinger, 2002; Robinson et al., 1996). One of the most comprehensive studies to date in this respect is Rentfrow and Gosling's (2003) investigation, in which the authors first determined the major dimensions of music preferences by means of exploratory and confirmatory factor analysis (CFA), and subsequently examined the associations of these dimensions with the well-established Big-Five personality factors. Four music-preference dimensions that were highly consistent across samples and time emerged from their analyses: The *Reflective and Complex* dimension, which was defined by the genres blues, jazz, classical and folk music; The *Intense and Rebellious* dimension, which was defined by Rock, alternative and heavy metal music; The *Upbeat and Conventional* dimension, which was defined by country, sound track, religious and pop music; The *Energetic and Rhythmic* dimension, which was defined by rap/hip-hop, soul/funk and electronica/dance music.

Rentfrow and Gosling (2003) found both the *Reflective and Complex* and the *Intense and Rebellious* dimensions to be positively related to Openness to Experience. The *Upbeat and Conventional* dimension was found to be positively related to Extraversion, Agreeableness and Conscientiousness, and negatively to Openness to Experience. The *Energetic and Rhythmic* dimension was positively related to Extraversion and Agreeableness. No substantial correlations were found between the music-preference dimensions and Emotional Stability.

Theories linking personality to music preferences

The *uses and gratification* approach (Rosengren, Wenner, & Palmgreen, 1985) may serve as a general theoretical framework for explaining associations between personality factors and music preferences. This approach has focused on the motives for individuals' music consumption and stresses individual choice and how 'people intentionally participate and select media messages from communication alternatives. . . what people do with the media, instead of what the media do to people' (Rubin, 1994, p 421). From this line of research, it appears that people prefer particular kinds of music because they have particular personality characteristics that the music satisfies (Arnett, 1995; Arnett, Larson, & Offer, 1995; Gantz, Gartenberg, Pearson, & Schiller, 1978; Larson, 1995). For example extraverts, who generally enjoy socialising and like spending time with others, tend to enjoy music that facilitates social interactions with peers (e.g. party music). Similarly, individuals high on Openness to Experience, who have a desire for 'variety, intellectual stimulation and aesthetic experiences' (Costa & McCrae, 1988, p 261), may prefer relatively 'difficult' or obscure types of music.

The music people choose may also serve to gratify physiologically based needs. According to the model of optimal stimulation (Eysenck, 1990; Zuckerman, 1979), people tend to choose the type of music that moves them toward their optimal arousal level. For example extraverts are considered to be on the low level of the cortical arousal scale and tend to choose the types of music which have the property to raise that level. Introverts, however, who are normally highly aroused, tend to avoid overstimulation by choosing less stimulating music (Daoussis & McKelvie, 1986).

Replication and extension of Rentfrow and Gosling

The present study builds on Rentfrow and Gosling's (2003) groundbreaking work and extends it in several ways. First, Rentfrow and Gosling used a sample of undergraduate college students. It is unclear to what extent their findings can be generalised to younger adolescents. Theoretically, adolescence can be considered a particularly relevant period for the study of music preferences. As already indicated, adolescence is the period when the amount of time devoted to listening to music is at its peak (Larson, Kubey, & Colletti, 1989; Zillman & Gan, 1997). Furthermore, one might expect more change in music preferences during adolescence than, for example, in older adults due to the changes in relationships with peers, who have been shown to be very influential in shaping adolescents' music preferences (Zillman & Gan, 1997). Lastly, adolescence is generally viewed as a formative phase for the development of music preferences, and it has been argued that music preferences crystallise during adolescence (Holbrook & Schindler, 1989). Therefore, it would be very important to examine (changes in) music preferences and their personality correlates during this critical period.

Second, as in most studies on music preferences, Rentfrow and Gosling (2003) used an American sample. It is unclear to what extent the structure of music preferences identified in their research, as well as their pattern of associations between personality and music preferences, generalises to other cultures or countries. Recently, inconsistent findings have been reported for Spanish and English samples regarding the association between Sensation seeking and Openness to Experience on the one hand and music preferences on the other hand (Rawlings, Vidal, & Furnham, 2000), suggesting that findings from this type of research cannot automatically be generalised across people from different regions. The present study tested the generalisability of Rentfrow and Gosling's findings to a sample of adolescents growing up in the Netherlands.

Third, as argued by Rentfrow and Gosling's (2003), a theory on music preferences should inform us on how music preferences develop and what factors influence their development. It should also give insight into the trajectory of music preferences and provide answers to questions such as how, when and why music preferences change. To date, however, most of what is known about changes in music preferences comes from comparisons between individuals of different ages. Age-group differences cannot automatically be interpreted as intra-individual (i.e. aging or within individual) effects such that as people grow older they increasingly prefer a certain type of music. To enable such interpretations, longitudinal studies of changes in music preferences are needed. Although Rentfrow and Gosling did compute test-retest reliabilities for their factors on the basis of two measurements with a 3-week interval, their data do not provide information on the stability and trajectory of music preferences over much longer periods of time (e.g. 1, 2 and 3 years). Their data also do not reveal to what extent personality characteristics predict over-time changes in music preferences. Such information would provide a more specific account of the role of personality characteristics regarding the development of music preferences. Therefore, in the present study, music-preference data were collected at four annual measurements.

In sum, the present study sought to examine the relations between Big-Five personality characteristics and (changes in) music preferences in a sample of Dutch adolescents. But before doing so, we used a similar factor-analytic approach as the one used by Rentfrow and Gosling (2003) to determine the major dimensions of adolescents' music preferences in the Netherlands. We specified the following research questions.

Research questions

1. What are the basic dimensions of adolescents' music preferences?
2. How stable are adolescents' music preferences over time?
3. How do adolescents' music preferences relate to existing dimensions of personality?
4. To what extent do personality characteristics predict over-time changes in adolescents' music preferences?

Given the limited empirical literature on these topics in the Netherlands, we had no *a priori* theories or expectations about the number of music-preference dimensions or the nature of the underlying structure. Consequently, we could not formulate any hypotheses regarding the associations between the music-preference dimensions that would emerge from our analyses and the Big-Five personality factors.

METHOD

Participants

The sample consisted of 2334 adolescent children in grades 7–12 who were between 12 and 19 years of age ($M = 14.37$, $SD = 2.33$). Of those who indicated, 1097 were boys, 1234 were girls, 1755 (75.2%) were Dutch, 55 (2.4%) were Surinamese/Antillean, 209 (9%) were Moroccan, 92 (3.9%) were Turkish and 86 (3.7%) had other ethnic backgrounds.

A subsample of 1243 adolescents was randomly selected from the original sample to participate in three follow-up assessments which took place 1, 2 and 3 years, respectively, after the initial assessment. At each of the four measurement waves, data on adolescents' music preferences and personality were collected. Eventually, 1044 adolescents (515 boys, 529 girls) participated at all four measurements. The mean age of these adolescents was 13.82 ($SD = 2.10$) at T1.

Procedure

Data of this study come from 12 schools participating in the first wave of the CONAMORE 2001–2006 longitudinal study (CONflict And Management Of Relationships; Meeus et al., 2002). Parents and students received a letter in which the aims of the study were described and information was given about the option of not participating. Less than 1% of the students decided not to participate. Participants completed a series of questionnaires in their classrooms, aided by research assistants who gave verbal instructions about the questionnaires. Written instructions were also included. Students who were absent on the days of testing were not assessed.

Measures

Adolescents' music preferences were assessed by means of the Musical Preference Questionnaire (MPQ; Sikkema, 1999). The MPQ consists of a list of 11 established categories of music. The items of the scale were partly generated on the basis of interviews with a large number of CD retailers in the Netherlands, as well as on a pilot-study conducted at several secondary schools. At these schools, a large number of students were interviewed and asked to name all the music genres they could think of. Genres that were consistently reported by the CD retailers and adolescents were included in the questionnaire. The eventual questionnaire consists of items representing the major contemporary music styles that have some degree of familiarity to Dutch adolescents (see Table 1). The items of the MPQ closely resemble the items of the Short Test Of Music Preferences questionnaire (STOMP) used by Rentfrow and Gosling (2003). In comparison with the STOMP, however, the MPQ does not contain the genres 'folk', 'country' and 'blues', because they were deemed to be too unfamiliar to Dutch adolescents. Also the MPQ does not contain the genre 'sound tracks' because of its heterogeneity. Subjects were asked to indicate on five-point Likert scales (1 = *very bad*, 5 = *very good*) the extent to which they liked each of the music genres listed.

Adolescents' personality was assessed by means of *Big-Five factors*. A Dutch adaptation (Gerris, Houtmans, Kwaaitaal-Roosen, Schipper, Vermulst, & Janssens, 1998) of 30 adjective Big-Five factors markers selected from Goldberg (1992) was used to have

Table 1. Factor loadings of the 11 music genres on four varimax-rotated principal components

Genre	Music-preference dimension			
	Rock	Elite	Urban	Pop/Dance
Heavy metal/hardrock	.88	.01	.05	−.04
Punk/hardcore/grunge	.87	.08	.02	.01
Gothic	.72	.22	.03	.10
Rock	.70	.22	−.04	.05
Jazz	.14	.75	.24	−.01
Classical music	.09	.74	−.33	.10
Gospel	.29	.67	.22	−.05
Hip-hop/rap	.15	−.00	.86	.09
Soul/R&B	−.16	.20	.71	.35
Trance/techno	.19	−.17	.10	.78
Top 40/charts	−.07	.17	.18	.77

Note: $N = 1183$. The highest factor loadings for each dimension are listed in boldface type.

adolescents judge their personalities. The participants rated the 30 adjectives on 7-point Likert scales ranging from 1 (*very untrue for me*) through 4 (*sometimes untrue, sometimes true for me*) to 7 (*very true for me*). All the Big-Five factors were rated: Extraversion, Agreeableness, Conscientiousness, Emotional Stability and Openness to Experience. The internal consistencies (Cronbach's alpha) for the different dimensions of Big-Five factors ranged from .77 for Openness to Experience to .87 for Agreeableness.

RESULTS

The structure of adolescents' music preferences: Exploratory and CFA

To identify the major dimensions of adolescents' music preferences, a two-step procedure was applied. For this purpose, our original sample was randomly divided into two independent subsamples of about equal size. First, exploratory factor analysis (EFA) was performed on the data of Subsample 1 ($N = 1183$). For reasons of comparability, the same factor analytic procedure (i.e. principal components factor analysis with Varimax rotation) was used as the one employed by Rentfrow and Gosling (2003).¹ Second, the generalisability and robustness of the factor solution obtained in Subsample 1 was evaluated by means of CFA on the data of Subsample 2 ($N = 1151$). The structural equation modelling (SEM) program LISREL 8 (Jöreskog & Sörbom, 1996) was used to perform the CFA.

EFA

Initially, the EFA of the Subsample 1 data was done separately for boys and girls and for younger (i.e. 12- to 15-year olds) and older (i.e. 16- to 19-year olds) adolescents. Because the overall pattern of loadings was highly similar for boys and girls and for younger and older adolescents, an EFA was performed for Subsample 1 as a whole.

¹To investigate the robustness of our EFA solution, alternative factor analytic procedures (Principle Axis and Maximum Likelihood) and rotations (Direct Oblimin) were used. The pattern of loadings was highly similar across procedures and rotation methods, whereas all procedures suggested the same number of factors (i.e. four) to be extracted.

Table 1 shows the varimax-rotated factor solution resulting from our EFA of the Subsample 1 music-preference data. On the basis of the scree test (Catell, 1966), the Kaiser rule (i.e. eigenvalues of 1 or greater) and the interpretability of the solution (see Zwick & Velicer, 1986), a four-factor solution was retained, which accounted for 67% of the total variance. As can be seen in Table 1, the factor structure was very clear and interpretable, with very few cross-loading genres. The genres loading most strongly on Factor 1 were heavy metal/hardrock, punk/hardcore/grunge, gothic and Rock, and this factor was named *Rock*. Factor 2 was defined by jazz, classical and gospel music, and this factor was named *Elite*. Factor 3 was defined by hip-hop/rap and soul/R&B, and was named *Urban*. Factor 4 was defined by trance/techno and top 40/charts, and was named *Pop/Dance*. The results from this exploratory investigation suggest that there is a clear underlying structure to adolescents' music preferences. Four interpretable factors were identified that capture a broad range of music genres.

CFA

To examine the generalisability and robustness of the four music-preference dimensions obtained in Subsample 1, we performed a CFA on the music-preference data of Subsample 2. We specified a model with four latent factors representing the four music-preference dimensions. All the genres that loaded highly (i.e. loadings of .40 or greater) on each of the respective factors in the EFA were freely estimated. In addition, the correlations between the latent factors were freely estimated. Evaluation of the fit of our model was based on multiple criteria (Bentler, 1990; Browne & Cudeck, 1989, 1993; Hu & Bentler, 1999; Loehlin, 1998). The results indicated that our model provided an adequate fit, $\chi^2(38, 458) = 136.99$, $p < .01$ (GFI = .95, CFI = .93, NNFI = .90, SRMR = .06).

Figure 1 shows the standardised parameter estimates for our CFA model. As can be seen, the factor loadings of all genres were significant and in the expected direction. Furthermore, all but one (Elite with Pop/Dance) intercorrelations among the music-preference dimensions were significant at the 1% level. The strongest correlations were found between the Rock and Elite dimension (.48), and between the Urban and Pop/Dance dimension (.40). In sum, the cross-sample congruence of the music-preference dimensions identified in our EFA and the fit from our CFA provide compelling evidence for the existence of four music-preference dimensions.

Stability of music preferences

To assess the stability of adolescents' music preferences and personality characteristics over time, unit-weighted scales were created to obtain scores for each of the music-preference and personality factors at all four measurement points. Next, we computed the correlations between scores of all measurement points for each of the music and personality dimensions. To check for age differences in these stabilities, analyses were done separately for a younger (i.e. 12- to 15-year olds) and an older (i.e. 16- to 19-year olds) subsample. As can be seen in Table 2, preferences for all four music dimensions remained fairly stable across 1, 2 and 3-year intervals. Although differences were not tested for statistical significance, there was a general trend of increasing stabilities across the three successive 1-year intervals (columns 1–6). Additionally, stabilities appear to be consistently higher in the older group than in the younger group. Taken together these findings suggest that music preferences are already fairly stable at early adolescence and become increasingly stable as adolescents grow older.

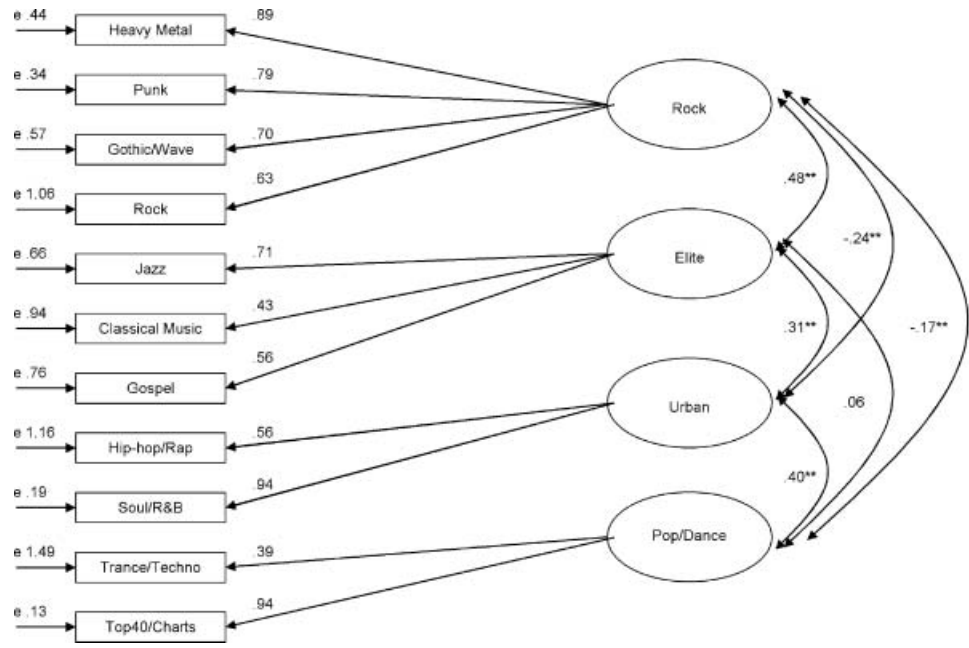


Figure 1. Standardised parameter estimates for CFA model of the music-preference data from the EFA. $\chi^2(38, 458) = 136.99$, $p < .01$ (GFI = .95, CFI = .93, NNFI = .90, SRMR = .06). Note: * $p \leq .05$; ** $p \leq .01$; e = error variance.

Contemporary associations between music-preference dimensions and personality characteristics

Having established the music-preference dimensions and their stability over time, we could address the question how music preferences are related to personality characteristics. Contemporary associations between adolescents' music preferences and personality characteristics were examined in two ways. First, at each of the four measurement waves, correlations were computed between the scale scores on the music-preference dimensions on the one hand and the personality dimensions on the other hand. An interesting pattern of associations was found that was highly similar across the four waves. As can be seen in Table 3, the Rock dimension was found to be positively related to Openness to Experience and negatively to Conscientiousness. Also, at two of the four measurement occasions (i.e.

Table 2. Stability correlations music preferences

	T1–T2		T2–T3		T3–T4		T1–T3		T2–T4		T1–T4	
	12–15	16–19	12–15	16–19	12–15	16–19	12–15	16–19	12–15	16–19	12–15	16–19
Rock	.49	.68	.57	.76	.69	.79	.35	.64	.46	.62	.24	.57
Elite	.48	.59	.49	.66	.57	.72	.39	.61	.46	.58	.43	.52
Urban	.49	.71	.58	.76	.64	.79	.43	.68	.49	.71	.38	.65
Pop/Dance	.48	.68	.62	.68	.65	.71	.33	.65	.49	.62	.37	.57

Note: All $ps \leq .01$; T1–T2 = interval from 1st to 2nd measurement, T2–T3 = interval from 2nd to 3rd measurement, etc.

Table 3. Correlations between personality and music-preference dimensions at T1, T2, T3 and T4

	Rock				Elite				Urban				Pop/Dance			
	T1	T2	T3	T4	T1	T2	T3	T4	T1	T2	T3	T4	T1	T2	T3	T4
Extraversion	-.00	-.03	-.11**	-.17**	.01	.03	-.05	-.03	.11**	.10**	.10**	.16**	.14**	.12**	.15**	.14**
Agreeableness	.03	.02	-.01	-.01	.13**	.16**	.13**	.18**	.06	.08*	.08*	.10**	.09**	.08*	.09**	.11**
Conscientiousness	-.09**	-.10**	-.17**	-.15**	.05	.08*	.06	.07*	-.02	.04	.07*	.07*	-.01	-.02	.09**	.05
Emotional stability	-.00	.03	-.05	-.04	-.07*	-.09**	-.09**	-.12**	.03	.01	-.02	.00	.05	.01	.00	-.04
Openness	.15**	.17**	.18**	.22**	.17**	.22**	.20**	.28**	.03	.00	-.01	-.00	.04	-.00	-.03	-.04

Note: N = 1044; T1 = data from wave 1; T2 = data from wave 2; T3 = data from wave 3; T4 = data from wave 4.
* $p \leq .05$; ** $p \leq .01$.

T3 and T4), negative associations were found between the Rock dimension and Extraversion. The Elite dimension was found to be positively related to Agreeableness and Openness to Experience. At two of the four measurements (i.e. T2 and T4), the Elite dimension was also found to be positively related to Conscientiousness. Negative associations were found between the Elite dimension and Emotional Stability. The Urban dimension and the Pop/Dance dimension were both found to be positively related to Extraversion and Agreeableness. Finally, both dimensions were found to be positively related to Conscientiousness at two (i.e. T3 and T4) and one (i.e. T3) of the four measurements, respectively.

The second way to examine the association between adolescents' music preferences and personality characteristics was by specifying an SEM model in which information from the four measurements was combined to estimate the associations between the four music-preference dimensions and the five personality dimensions. In this procedure, each wave was treated as an item of a four-item (i.e. one for each wave) scale. This approach was partly motivated by our finding that all four music-preference dimensions and all five personality factors were considerably stable across time. Prior to the SEM analysis, for each of the music-preference and personality factors, a mean score was computed on the basis of the scores across the four measurements. In the SEM model, disattenuated correlations were estimated by controlling for measurement errors, which were computed on the basis of the reliabilities of the four-item scales.

Again the program LISREL 8 (Jöreskog & Sörbom, 1996) was used to perform the SEM analysis. Since our SEM model is saturated, with zero degrees of freedom, the fit is perfect ($p = 1$). Table 4 gives the standardised coefficients for the correlations between music preferences and personality resulting from this analysis.² The results strongly corroborate the findings of the previous analyses reported in Table 3. Multigroup analyses were performed to check for age differences in the associations between music preferences and personality factors. Only 3 (out of the possible 20) significant age differences were found. First, preference for Elite music was negatively related to Extraversion for the younger age

Table 4. Standardised SEM coefficients for the correlations between four-wave averages of personality and music-preference scores

Big Five	Rock	Elite	Urban	Pop/Dance
Extraversion	-.12** (.01)	-.02 (.00)	.19** (.02)	.22** (.05)
Agreeableness	.03 (.00)	.28** (.08)	.10* (.01)	.15** (.02)
Conscientiousness	-.21** (.04)	.10** (.01)	.05 (.00)	.04 (.00)
Emotional stability	-.03 (.00)	-.18** (.03)	-.00 (.00)	-.00 (.00)
Openness	.30** (.09)	.38** (.14)	-.03 (.00)	-.04 (.00)

Note: Explained variances are between brackets.

* $p \leq .05$; ** $p \leq .01$.

²Uncorrected correlations between Rock and Extraversion, Agreeableness, Conscientiousness, Emotional Stability and Openness were -.10, .03, -.18, -.03 and .24, respectively; Uncorrected correlations between Elite and Extraversion, Agreeableness, Conscientiousness, Emotional Stability and Openness were -.01, .22, .09, -.15 and .31, respectively; Uncorrected correlations between Urban and Extraversion, Agreeableness, Conscientiousness, Emotional Stability and Openness were .16, .08, .04, -.00 and -.02, respectively; Uncorrected correlations between Pop/Dance and Extraversion, Agreeableness, Conscientiousness, Emotional Stability and Openness were .18, .12, .04, -.00 and -.04, respectively.

group (i.e. 12- to 15-year olds), but positively related to Extraversion for the older age group (i.e. 16- to 19-year olds) ($-.10$ and $.15$, respectively; $\Delta\chi^2 = 10.23$, $\Delta df = 1$, $p < .01$). Second, preference for Elite music was positively related to Conscientiousness for the younger age group, but (nonsignificantly) negatively related to Conscientiousness for the older age group ($.15$ and $-.04$, respectively; $\Delta\chi^2 = 4.37$, $\Delta df = 1$, $p < .05$). Finally, preference for Urban music was (nonsignificantly) positively related to Emotional Stability for the younger age group, but (nonsignificantly) negatively related to Emotional Stability for the older age group ($.07$ and $-.10$, respectively; $\Delta\chi^2 = 4.73$, $\Delta df = 1$, $p < .05$).

Next, we tested to what extent the pattern of associations between personality and music preferences reported by Rentfrow and Gosling (2003) fitted the present data. For this purpose, the fit of a restrictive and a less-restrictive model was assessed. In these models, Rentfrow and Gosling's Intense and Rebellious dimension corresponded with our Rock dimension (both dimensions are largely defined by the genres Rock and heavy metal), their Energetic and Rhythmic dimension corresponded with our Urban dimension (both dimensions are largely defined by the genres hip-hop/rap and soul), their Upbeat and Conventional dimension corresponded with our Pop/Dance dimension (both dimensions are largely defined by the genre pop) and their Reflective and Complex dimension corresponded with our Elite dimension (both dimensions are largely defined by the genres jazz and classical). In the restrictive model, the correlations between the personality factors and the music-preference dimensions were fixed on the values reported by Rentfrow and Gosling for their Study 2 sample. In the less-restrictive version of the model, the correlations Rentfrow and Gosling reported to be statistically significant were freely estimated, whereas the nonsignificant correlations were fixed to zero. The restrictive model yielded a reasonable fit to the data ($\chi^2(20, 1044) = 248.43$, $p < .01$, GFI = .96, CFI = .86, SRMR = .07). However, the less-restrictive model fitted the data significantly ($\Delta\chi^2 = 125.64$, $\Delta df = 9$, $p < .01$) better ($\chi^2(11, 1044) = 122.79$, $p < .01$, GFI = .98, CFI = .93, SRMR = .05). In Table 5, the correlations emerging from our less-restrictive model, as well as those reported by Rentfrow and Gosling are given. Altogether, the different types of analyses indicate that our pattern of associations between music preferences and personality characteristics closely matches the one found by Rentfrow and Gosling. However, two correlations did not seem to match across both studies. First, the correlation between Emotional Stability and Rentfrow and Gosling's Reflective and Complex dimension was significantly positive, whereas the correlation between Emotional Stability and the corresponding Elite dimension in the present study is negative. Second, the correlation between Openness and Upbeat and Conventional was significantly negative in Rentfrow and Gosling's study, whereas the correlation between Openness and the corresponding Pop/Dance dimension was nonsignificant in the present research.

Associations between personality characteristics and changes in music preferences: Latent growth curve modelling (LGM)

LGM (Duncan, Duncan, & Strycker, 2001; Mehta & West, 2000; Muthén & Curran, 1997) was used to examine associations between the Big-Five factors and changes in music preferences. These LGM analyses were performed in two steps. In the first step, growth curve models were constructed separately for each music-preference dimension in order to investigate the extent of individual variation in the initial level and the linear growth component of each music-preference variable. The models included two latent factors. The

Table 5. Correlations between Big-Five personality factors and music-preference dimensions in Rentfrow and Gosling's (2003) Study 2 sample and in our less-restrictive model

	Rentfrow and Gosling (2003)				Less-restrictive model			
	Intense and rebellious	Reflective and complex	Energetic and rhythmic	Upbeat and conventional	Rock	Elite	Urban	Pop/Dance
Extraversion	.00	.01	.22*	.24*			.18*	.22*
Agreeableness	-.04	.01	.08*	.23*			.11*	.22*
Conscientiousness	-.04	-.02	.00	.15*				.05
Emotional stability	-.01	.08*	.01	-.07		-.16*		
Openness	.18*	.44*	.03	-.14*	.33*	.22*		-.02

Note: $N = 1044$; Blanks represent the parameters that were fixed to zero.
* $p \leq .05$.

first latent factor is labelled the *intercept* and corresponds to the initial status of the dependent variable: for example the adolescents' preference for Rock music at Time 1. The intercept is a constant for any individual across time that represents information about the mean and the variance of the collection of individual intercepts. The loadings of all four measured variables on the intercept factor are constrained to 1. The second factor, labelled *slope*, represents the rate of change (increase, decrease) in preferences for a music dimension over the period of the study (i.e. from Time 1 to Time 4).

We specified a linear change trajectory by fitting a model with the slope factor loadings for Time 1, Time 2, Time 3 and Time 4 being 0, 1, 2 and 3, respectively. To account for age differences, adolescents' age at the first measurement was used as a predictor of the intercept and slope factors (see also Duncan, Duncan, Strycker, Li, & Alpert, 1999; Mehta & West, 2000; Meredith & Tisak, 1990). No other predictors were included in these initial models. In the second step, growth curve models were tested in which, in addition to adolescents' age at the first measurement, Big-Five personality scores at the first measurement were included as predictors of the intercept and slope factors. To control for possible gender effects, adolescents' gender was included as an additional predictor variable (Figure 2). In these models, personality at T1 was allowed to covary with both age and gender, as is indicated by the curved arrows between these variables. Again the SEM program LISREL 8 (Jöreskog & Sörbom, 1996) was used to perform the LGM analyses.³

Table 6 contains the parameter estimates of the first series of growth curve analyses. The fit indices indicate that these models generally provided a good fit to the data. Chi-squares

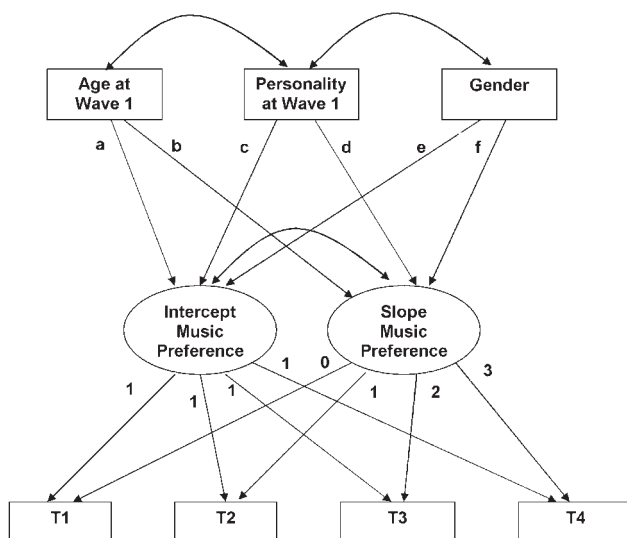


Figure 2. General growth curve model that was estimated for each Big-Five factor and each music-preference dimension. The double-headed curved arrows between the factors indicate that latent factors are allowed to covary. T1, T2, T3 and T4 refer to the dependent variable measured annually for 4 years (T1 = Time 1; T2 = Time 2; T3 = Time 3; T4 = Time 4).

³ Alternative LGM models were tested to examine possible associations between adolescents' music preferences at T1 and over-time changes in Big-Five personality characteristics. None of the effects of T1 music preferences on the Big-Five slope factors turned out to be statistically significant, indicating that initial music preferences did not predict subsequent changes in personality.

Table 6. Univariate latent growth curve results for adolescents' music preferences

Music preference	Intercept		Slope	
	<i>M</i>	σ^2	<i>M</i>	σ^2
Rock	2.92**	.60**	-0.22**	.07**
Elite	2.01**	.38**	-0.25**	.02**
Urban	3.95**	.65**	0.19*	.05**
Pop/Dance	4.27**	.48**	-0.35**	.05**

* $p \leq .05$; ** $p \leq .01$.

ranged from 107.31 to 218.80, with a mean of 157.56 for models with 10 degrees of freedom (N ranging from 908 to 1001), all $ps < .01$. The GFI ranged from .93 to .97 with a mean of .95, the CFI ranged from .98 to .99 with a mean of .99, the NNFI ranged from .97 to .99 with a mean of .98 and the SRMR ranged from .01 to .05 with a mean of .04.

The significant mean estimates for the intercepts in the first column of Table 6 show adolescents' initial mean scores on the music-preference factors; their significance only indicates that the scores significantly differed from zero (which is trivial for ratings on 1–5 scales). These mean scores indicate that Pop/Dance is rated most positively, followed by, Urban, Rock and Elite, respectively. As can be seen in the second column, the variance for the intercept factors was significantly different from zero for all music-preference scores, which indicates that there were systematic individual differences in adolescents' initial (Time 1) music preferences.

The slope mean estimates (see Table 6, third column) indicate that for three of the four music-preference dimensions (i.e. Rock, Elite, Pop/Dance), the slope mean was significantly negative, indicating that adolescents' mean levels showed a decreasing trajectory from Time 1 to Time 4. In other words, adolescents on average show weaker preferences for these music categories over time. For the dimension of Urban, the slope mean was significantly positive, indicating that adolescents' mean levels showed an increasing trajectory over a 3-year period. In other words, adolescents on average show stronger preferences for this music category over time. For all four music factors, the slope factor variance was found to be significantly different from zero ($p < .01$) (see Table 6, fourth column), indicating that systematic individual differences were found for adolescents' changes in their preferences for these music categories.

In the second step of our LGM analyses, growth curve models were specified to investigate the associations between Big-Five personality factors and *changes* in adolescents' music preferences. For each of the four music-preference factors, five growth curve models were tested in which, in addition to adolescents' age at the first measurement, the T1 scores on one of the five personality factors as well as adolescents' gender were included as predictors of the intercept and slope factors (see Figure 2), resulting in a total of 20 models in this second series of LGM analyses.

The fit of these 20 LGM models to the data was generally good, with chi-squares ranging from 95.11 to 207.76, and a mean of 154.48 for models with 15 degrees of freedom (N ranging from 785 to 876), $p < .01$, GFI ranging from .94 to .97 with a mean of .96, the CFI ranged from .99 to 1.00 with a mean of .99, the NNFI ranged from .98 to .99 with a mean of .99 and the SRMR ranged from .01 to .04 with a mean of .03.

Table 7. Standardised beta coefficients for the effects of personality at wave 1 on intercept and slope factors music preferences

Big Five	Rock		Elite		Urban		Pop/Dance	
	I	S	I	S	I	S	I	S
Extraversion	-.01	-.11*	.01	.05	.13**	.07	.15**	-.07
Agreeableness	.06	.01	.13**	.04	.03	-.05	.10*	-.14*
Conscientiousness	-.12**	-.03	.05	-.04	-.01	.05	.02	.02
Emotional stability	-.01	-.08	-.09*	-.07	.03	.10	.04	-.05
Openness	.19**	.07	.27**	.09	.02	-.16**	.04	-.21**

Note: I, intercept; S, slope.

* $p \leq .05$; ** $p \leq .01$.

The coefficients for the effects of personality at the first measurement on the intercept and slope factors of the music-preference dimensions (paths c and d, respectively, in Figure 2) are given in Table 7. With regard to the correlations between wave-1 personality and the intercept factors of music preferences (see columns 1, 3, 5 and 7), our findings generally corroborate our previous findings (see Tables 3–5) regarding the associations between music preferences and personality. Also several significant associations were found between wave-1 personality and the slope factors of music preferences (see columns 2, 4, 6 and 8), indicating that individual differences in personality at Time 1 predicted individual differences in the rate of change in music preference from Time 1 to Time 4. Adolescents' initial level of Openness to Experience predicted changes in preference for Pop/Dance music ($-.21$, $p < .01$) and Urban music ($-.16$, $p < .01$). This means that adolescents who had higher initial levels of Openness to Experience tended to report higher rates of decrease in preference for Pop/Dance music over time and lower rates of increase in preference for Urban music. Changes in preference for Pop/Dance music were also significantly predicted by initial levels of Agreeableness ($-.14$, $p < .05$). This means that adolescents who had higher initial levels of Agreeableness tended to report higher rates of decrease in preference for Pop/Dance music over time. Finally, adolescents' initial level of Extraversion was found to predict changes in preference for Rock music ($-.11$, $p < .05$). This means that adolescents who had higher initial levels of Extraversion tended to report higher rates of decrease in preference for Rock music over time.

Our LGM analyses also revealed several interesting associations between age and the music-preference intercepts and slopes (paths a and b, respectively, in Figure 2). Age was negatively related to the intercepts of Rock ($-.12$, $p < .01$) and Pop/Dance ($-.10$, $p < .05$) music, indicating that, at the first measurement, older adolescents show weaker preferences for these music categories. Furthermore, age was found to be positively related to the intercept of Elite ($.09$, $p < .05$) music, indicating that older adolescents show stronger preferences for this music category.

In addition to these age-intercept correlations, significant associations were found between adolescents' age and the linear trajectory of all four music-preference dimensions. Positive associations were found between age and the slopes of Rock ($.10$, $p < .05$), Elite ($.25$, $p < .01$) and Pop/Dance ($.15$, $p < .01$) music. This means that older adolescents tended to report lower rates of decrease over time in preference for Rock, Elite and Pop/Dance music. A negative association was found between age and the slope factor of Urban

music ($-.15, p < .01$), indicating that older adolescents tended to report lower rates of increase in their liking for this type of music.

Finally, several significant associations between gender and the music-preference intercepts and slopes were found (paths e and f, respectively, in Figure 2). Boys showed stronger preferences for Rock, whereas girls showed stronger preferences for Elite and Urban at the first measurement. In addition to these gender-intercept correlations, significant associations were found between adolescents' gender and the linear trajectories of Rock and Urban. In comparison with boys, girls showed lower rates of decrease over time in preference for Rock, and higher rates of increase over time in preference for Urban.

DISCUSSION

The purpose of this paper was to examine the structure of Dutch adolescents' music preferences, the stability of these preferences over time and the associations between (changes in) these preferences and Big-Five personality characteristics.

Factor structure and stability of music preferences

Exploratory and confirmatory factor analyses revealed four clearly interpretable music-preference dimensions which were labelled Rock, Elite, Urban and Pop/Dance. The pattern of loadings strongly resembled the one reported by Rentfrow and Gosling (2003), thus providing support for the generalisability of Rentfrow and Gosling's four-factor structure of music preferences across cultures and age groups. In spite of this general cross-sample consistency, however, several differences could be noted between the Dutch and American factor solutions. In the Dutch adolescent sample, for example, the genre trance/techno loaded on the Pop/Dance factor, whereas in the United States, the comparable genre electronica/dance loaded on the Energetic and Rhythmic factor (instead of on the Upbeat and Conventional factor which corresponds to the Dutch Pop/Dance factor). Furthermore, in the Netherlands, the genre gospel loaded on the Elite factor, whereas in the United States, the comparable genre religious music loaded on the Upbeat and Conventional factor (instead of on the Reflective and Complex factor which corresponds to the Dutch Elite factor). An explanation for these differences may lie in the relative popularity of these genres in the Netherlands and in the United States. The fact that in the Netherlands, trance/techno and top 40/charts load on the same factor (i.e. Pop/Dance) may be due to the fact that trance/techno music appears to be far more popular in the Netherlands, and probably most of Europe, than in the United States (see e.g. Stevens, 2001; Stevens & Elchardus, 2001; Ter Bogt, Engels, Hibbel, Van Wel, & Verhagen, 2002). Over the last decade, trance/techno music has become part of conventional mainstream culture in the Netherlands, which may explain why adolescents who like top-40 music also tend to like trance/techno music. Religious music, on the contrary, appears to be far more popular in the United States than in the Netherlands, which may explain why in Rentfrow and Gosling's (2003) study this genre loads on the Upbeat and Conventional factor, as does, for example, the genre pop. In Dutch society, which is highly secularised, religious music plays a marginal role and appears to belong mainly to the domain of elite culture. Taken together, these findings suggest that, although the overall factor structure was highly similar in both the United States and the Netherlands, differences in popularity of genres in different regions may impact the dimensional structure of music preferences. Future

research in other regions and cultures, and across other age groups, should provide further information on the generalisability of the factor structures found in this and Rentfrow and Gosling's study.

The relatively high stability correlations that were found for the music-preference dimensions indicate that music preferences remain fairly stable across time. Our findings also suggest that music preferences are becoming more stable during the course of adolescence. This increasing stability of adolescents' music preferences with age may be associated with the fact that adolescents' self-views become more stable as a result of adolescents' identity formation (Erikson, 1968). This finding is consistent with the idea that music preferences crystallise during adolescence (Holbrook & Schindler, 1989).

Associations between personality and (changes in) music preferences

Across different types of analyses, a consistent pattern of contemporary associations between music preferences and personality characteristics emerged. Adolescents who enjoy Rock tend to be relatively low on Conscientiousness and relatively high on Openness to Experience. Adolescents who enjoy Elite tend to be relatively high on Agreeableness, Conscientiousness and Openness to Experience and relatively low on Emotional Stability. Adolescents who enjoy Urban tend to be relatively high on Extraversion and Agreeableness, as are adolescents who enjoy Pop/Dance. Our SEM analyses indicate that the pattern of correlations we found between music-preference dimensions and Big-Five personality characteristics was highly similar across age groups and closely resembles the pattern of associations reported by Rentfrow and Gosling (2003). Age differences were found for Elite, which was negatively related to Extraversion and positively related to Conscientiousness for the younger age group, but positively related to Extraversion and (nonsignificantly) negatively related to Conscientiousness for the older age group. Preference for this type of music may point at a somewhat more introverted and careful nature in younger adolescents, whereas during late adolescence, when preference for Elite may have become somewhat more common, it may point at a somewhat more outgoing personality. Also with regard to Urban, an age-group difference was found in the relation with Emotional Stability. This difference, however, should be interpreted with caution since effects in both the younger and older age group were nonsignificant.

Although our pattern of associations between music preferences and personality characteristics closely resembles the one reported by Rentfrow and Gosling (2003), a striking difference is that, in our study, preference for Elite music was negatively related to Emotional Stability, whereas Rentfrow and Gosling did not find substantial consistent associations between this trait and any of the four music dimensions. This difference may be due to age differences. A strong preference for Elite music may be quite appropriate for the college students in Rentfrow and Gosling's sample, but it may be relatively odd and associated with signs of neuroticism for the somewhat younger adolescents in our sample. Note, however, that, consistent with Rentfrow and Gosling's study, adolescents who prefer Rock music do not appear to display signs of neuroticism or disagreeableness, despite previous findings that the Rock dimension contains music that emphasises negative emotions.

Another difference between Rentfrow and Gosling's (2003) study and our study is that, in the present study, correlations between music-preference dimensions and personality factors generally appear to be somewhat lower. A possible explanation for this finding could lie in the age difference between the two samples. Personality factors may have a

larger effect on the musical preferences of the older, more autonomous, college students in Rentfrow and Gosling's sample than on those of the younger adolescents in our sample, for which peer influences might be more salient. Note, however, that hardly any age differences showed up in our multigroup analysis comparing the associations between personality factors and music preferences for the older and younger adolescents. Therefore, other differences between the two samples (e.g. cultural differences) may account for the somewhat lower correlations in the present study. Future studies with samples of adolescents in the US and college students in the Netherlands could further clarify the role of age and culture with regard to the associations between personality and music preferences.

Our LGM analyses revealed that, in addition to being cross-sectionally related to music preferences, personality factors predicted *changes* in these preferences. Adolescents who had higher initial levels of Openness to Experience tended to report higher rates of decrease in preference for Pop/Dance music over time and lower rates of increase in preference for Urban music. Furthermore, adolescents who had higher initial levels of Agreeableness tended to report higher rates of decrease in preference for Pop/Dance music over time. Finally, adolescents who had higher initial levels of Extraversion tended to report higher rates of decrease in preference for Rock music over time.

Theoretical explanations for the associations between personality and (changes in) music preferences

The *uses and gratifications* perspective (Arnett, 1995; Arnett et al., 1995; Gantz et al., 1978; Larson, 1995; Rubin, 1994), according to which people like the kinds of music that satisfy certain needs, may provide hints to explain some of the associations that were found between personality characteristics and (changes in) music preferences. The positive contemporary associations between Extraversion and both Urban and Pop/Dance are in line with extraverts' desire to socialise with peers and to have fun. Urban and Pop/Dance music are the two most popular styles that are most often played at parties and social gatherings of youngsters. Extraverts may show more rapid declines in preference for Rock music, because this more alternative, and less popular, style is less suited to provide them with the social contacts they desire.

Parties and social gatherings may also be the settings that satisfy the interpersonal needs (e.g. an eagerness to help others) of agreeable adolescents, which may account for the fact that positive associations with both Urban and Pop/Dance were also found for Agreeableness. Compassion for others may also be reflected in the lyrics of religious or gospel music, which may account for the positive association that was found between Agreeableness and the Elite dimension. Maybe, as they grow older, these relatively sociable adolescents do not need the most popular music genres anymore to facilitate social interactions with peers, which may account for their more rapid decrease in their liking of Pop/Dance.

The positive contemporary associations that were found between Openness to Experience and the relatively complex Elite and nonmainstream Rock dimensions may be explained by the fact that individuals high on Openness have a desire for variety, intellectual stimulation and unconventionality (Costa & McCrae, 1988). Adolescents who are relatively open minded and interested in new experiences may also develop a more negative attitude toward the more popular and conventional musical genres as they grow older as they may have a greater tendency to look for experiences outside of the mainstream

culture. This may account for our finding that adolescents relatively high on Openness showed a more rapid decrease in their liking of Pop/Dance and a less rapid increase in their liking of Urban. Finally, the negative association that was found between Conscientiousness and Rock may be explained by the fact that the 'will to achieve', typical for individuals high on Conscientiousness, may be relatively absent in Rock fans.

Some of the above-mentioned needs may be grounded in physiological characteristics. Thus, for example, the positive associations we found between Extraversion and both Urban and Pop/Dance may also be explained from the model of optimal stimulation (Eysenck, 1990; Zuckerman, 1979), according to which individuals tend to prefer the music that moves them toward their optimal arousal level. Extraverts may like these music styles in particular because of their capacity to move them up toward their optimal arousal level. Likewise, emotionally unstable adolescents may tend to avoid overstimulation by choosing less stimulating music (Daoussis & McKelvie, 1986), which may account for the negative association we found between Emotional Stability and Elite music.

Clearly, not all associations found between personality characteristics and music preferences can equally easily be explained from a *uses and gratifications* perspective. To bridge the remaining gaps between personality factors and music preferences, we need to know more about the specific (physiologically grounded) needs that are associated with these personality factors (see e.g. Costa & McCrae, 1988), as well as about the needs expected to be gratified by certain types of music.

One should note that correlations between personality characteristics and (changes in) music preferences were generally found to be small-to-moderate. Essentially, this means that, when explaining (changes in) music preferences, factors other than personality characteristics have to be taken into account. Likely candidates include factors such as cognitive abilities, peer influences and social class. Future studies will need to examine many other possible determinants in order to develop a more comprehensive theory of music preferences.

Additional findings

Our first series of LGM analyses revealed several other findings that were not directly related to our research questions. It was found that adolescents show weaker preferences for Rock, Elite and Pop/Dance music, but stronger preferences for Urban music over time. The declining trajectories for Rock and Pop/Dance music are in line with our finding that at T1, older adolescents show weaker preferences for these music categories. These findings suggest that, as adolescents get older, they become less defiant and more adventurous and autonomous in their musical taste. The less rapid decline we found for older adolescents' preferences for these genres may be due to the fact that older adolescents already showed weaker preferences for these categories at the start of the study. The decreasing trajectory for Elite may, at first glance, seem discordant with our finding that at T1, older adolescents show stronger preferences for this genre. Note, however, that mean level trajectories result from a complex mixture of age-related changes and, for example, changes related to the overall popularity of musical genres at a given point in time. Maybe in this case, increasing preferences for Elite music as one gets older have been compensated for by a general decline in the popularity of this genre among adolescents over the 3 years of this study. Closer inspection of our data indeed revealed that for most age groups, the popularity of Elite music showed a decreasing trend over the 3-year period. In line with our earlier suggestion that older adolescents may be more adventurous, less conventional, in their

musical taste, older adolescents were found to show lower rates of decrease over time for Elite music.

The fact that adolescents were found to show stronger preferences for Urban over time may partly be explained by the increasing popularity of this music category over the last couple of years. It does not seem to be an effect of increasing age, since no association was found between age and preference for Urban at T1. Note, however that older adolescents were found to report lower rates of increase in their liking for Urban music, which, again, is consistent with their supposed more adventurous, less mainstream, music taste.

Limitations

The present study has several limitations. First, although personality characteristics at T1 were found to predict over-time changes in music preferences, causal inferences should be made with caution. Second, adolescents in the present sample are nested within school grades. This may lead to dependencies in the data that are not accounted for by our analyses. Application of Multilevel analyses (Raudenbush & Bryk, 2002) that do account for these dependencies could be a direction of future research. Third, only self-reports of music preferences were used. By doing so, we assumed that adolescents are able to accurately report on their music preferences. It may not be ruled out, however, that impression-management motivations play a role in these reports. For example an individual may enjoy listening to classical music but might report no preference for it if listening to classical is considered 'uncool'. The impact of this impression-management bias may be relatively minor, however, since Rentfrow and Gosling (2003) have demonstrated that a similar factor structure emerged using either self-report data or data based on the music individuals had downloaded from the Internet.

Despite these limitations, the present investigation provides compelling evidence that there is a clear structure underlying Dutch adolescents' music preferences. This structure shows close resemblance to the one reported by Rentfrow and Gosling (2003) for a somewhat older group of college students in the United States. This suggests that the structure identified in our and in Rentfrow and Gosling's study may show considerable generalisability across cultures and age groups. Future research in other age groups and other, especially nonwestern, cultures should provide further evidence for the universality of the structure of music preferences identified in this study. Furthermore, our findings clearly demonstrate that music preferences are already fairly stable during early adolescence and become increasingly stable toward late adolescence. Finally, our results are consistent with the idea that personality has an impact on music preferences. The music adolescents select partly reflects their personalities and associated needs and thus knowing what music a person likes may serve as a clue to his or her personality.

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