



## **Aesthetic activities and aesthetic attitudes: Influences of education, background and personality on interest and involvement in the arts**

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There have been few studies of why some people are frequently involved in aesthetic activities such as going to the theatre, reading or playing musical instruments, whereas others are less involved. This study assesses the broad roles of education, personality and demographic factors such as social class, age and sex. More aesthetic activity was associated with music and art education, whereas science education had a substantial negative relationship with aesthetic activity, both directly and also indirectly via reduced art education. More aesthetic activity was particularly related to higher scores on the personality factor of openness, and also to lower scores on agreeableness and conscientiousness. Higher parental social class was also associated with more aesthetic activity, as also was lower age. Sex had no relationship to aesthetic activity, as neither did masculinity – femininity. Positive aesthetic attitudes were also related moderately to aesthetic activity, but were particularly strongly related to openness to experience, and somewhat less to extraversion. Class, age and sex had no direct relationship to aesthetic attitudes.

The arts, defined in their broadest sense as music in its multifarious forms, the visual arts of representation, decoration and adornment, the performance arts of theatre and dance and the literary arts of novel-writing, poetry and other forms of text, as well as a huge range of applied arts, consume large amounts of time and effort in all societies. In many cases they are also the basis of major industries, as with the music industry, cinema, television, publishing and other media, all of which are of economic consequence in Western societies. Individually, there are few people who do not spend time on most days in some form of aesthetic consumption, even if it consists only of listening to the radio while in the car, looking at advertising hoardings, painting the bathroom, choosing new clothes, cooking food or watching television.

Given the ubiquity of the arts in human life, and particularly given that they are often claimed to be such a peculiarly human activity, stretching back perhaps 30,000 years or more into prehistory, one of the surprising things is how little they have been

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investigated by psychology and the behavioural sciences (Wilson, 2002). Of course, there are large literatures on the psychology (or psychopathology) of individual artists or composers; there are books on the nature of creativity or genius (Sternberg, 1999); there are occasional studies of attempts to measure specific knowledge about an art form (Miller, 2000); and there are studies of the neuropathology of the individual damaged artistic brain (Cantagallo & Della Sala, 1998; Halligan & Marshall, 1997; Marsh & Philwin, 1987). Further, since the time of Fechner and his Golden Section studies (Fechner, 1871, 1876), there have been occasional attempts to carry out studies in experimental aesthetics (Berlyne, 1971; Burt, 1933; Kreitler & Kreitler, 1972; Valentine, 1913, 1962), but those studies have little to say about the typical consumer of the arts; about concert-goers, amateur painters, musicians playing piano at home for their own pleasure or people listening to pop music on the radio or dancing at a discotheque. Perhaps most intriguing of all is that, although at a general level the arts are in some sense a universal human activity, not all humans are interested in all of them, find them attractive or want to be involved or take part in them. Indeed, some people have attitudes towards the arts which are extremely negative and they have been labelled philistine.

Of course, the paucity of studies is not entire and there are important exceptions, such as Pierre Bourdieu's seminal work of 1969 (Bourdieu, Darbel, & Schapper, 1991), which used a questionnaire to study nearly 10,000 visitors to European art galleries and museums. Although necessarily limited by the fact that the study population had already entered the galleries, it nevertheless showed, among other things, the interrelationship of multiple forms of cultural involvement, those going to galleries more often also being more likely to go to concerts, theatre and cinema. There were also clear influences of education, background and social class upon cultural involvement as a leisure activity. Other studies have looked at individual activities, as in Argyle's reviews of leisure activities such as watching television, listening to music and dancing (Argyle, 1992, 1996) or studies of reading (Mann & Burgoyne, 1969). There have also been studies of the personality correlates of a liking or disliking for particular types of music (Dollinger, 1993); of television watching (Persegani *et al.*, 2002); of preference for particular styles of painting (Feist & Brady, 2004; Furnham & Bunyan, 1988; Furnham & Rao, 2002; Furnham & Walker, 2001c; Rawlings, Vidal, & Furnham, 2000); and of personality in relation to creativity (Barron & Harrington, 1981). However, a broad picture of a range of activities is lacking.

There is an interesting and relevant literature on the relationship between the individual difference variable of sensation-seeking and various measures of interest in art. Zuckerman (1994) argues that art, music, literature and the media have, in varying capacity, the ability to arouse a person, and he also notes:

Complexity and ambiguity are two qualities of visual stimuli that produce arousal. Liking for designs, art and music show the high sensation seekers' interests in complex and ambiguous (as in complex abstract art) and intense (as in rock music) stimuli, and the low sensation seekers' preferences for calming, low-tension art and music. (p. 220)

The present study looks at the variation in, for want of a better term, *aesthetic activities* (be they active as a producer or passive as a consumer), and assesses how that variation relates to *aesthetic attitudes*, as well as to social background, education and personality. The study in some ways is similar therefore to that of McManus (1985), which although large was restricted to the study of medical students. That study found evidence for several different factors underlying aesthetic activities, with a clear general factor of aesthetic or cultural activity.

Although inevitably to some extent an exploratory study, the choice of background variables was partly theoretically driven. The modern consensus among personality theorists that there are probably five major factors underlying personality (the Big Five), made those factors an obvious choice for inclusion, particularly as there are potential reasons for several of them being related to aesthetic activities. Eysenck's conception of extraversion regarded extraverts as 'stimulus hungry', searching for new forms of sensory stimulation (Matthews, Deary, & Whiteman, 2003), and aesthetic activities could easily be seen as a partial source of that novelty and, indeed, this is the underlying theme in Zuckerman's (1994) work. In contrast, the construct of openness to experience in the Big Five, perhaps the newest and least characterized of the five factors, specifically seems to be related to intellectual and cultural experiences, as opposed to the simple sensory stimulation involved in extraversion. Studies of the personality of creative artists often report higher neuroticism (Feist, 1999) and as a concomitant there is often a greater incidence of psychiatric problems among artists (Jamison, 1995; Ludwig, 1995); the consumption of aesthetic activities might also therefore be related to neuroticism. Finally, many aspects of aesthetic consumption require an efficient, organized world, particularly where the production of aesthetic works is produced, as in practice and rehearsal when playing music, setting aside time for painting or drawing or collaborating in the performing arts; a high level of conscientiousness might well be desirable for these, as well as for the advance planning that is required for planning and booking theatre tickets, etc. Whether agreeableness should be related to aesthetic activities is far from clear; many of them are carried out socially in groups, e.g. attending concerts and discos, but there is also a possibility that creativity requires artists to restrict their social activities in order to obtain the time and space that is required to be creative.

There has recently been a number of studies relating the Big Five to art judgment, preference and knowledge. Furnham and Chamorro-Premuzic (2004) looked at the relationship between personality, intelligence and art experience (defined by activities, interest and knowledge) and a test of art judgment. They found that 'Openness to experience was related to art experience (i.e. preference), but not to art judgment (i.e. ability), while intelligence was significantly related to art judgment, but not to art experience'. In addition, art judgment was also related to extraversion and low conscientiousness.

Using a different sample and a different art ability test, Chamorro-Premuzic and Furnham (2005a) found openness to experience, but no other trait variables, was related to art activities based on visits to art galleries and the purchasing of art. Participants high in openness but low in extraversion did best on self-reported art knowledge. Art judgment (ability) was predicted by four factors: intelligence, low conscientiousness, introversion and art interest.

Much theorizing in recent years has emphasized the major disparity in the sex ratio of those producing creative arts, with Miller (2000) arguing from an evolutionary perspective that the arts are, in some sense, the human equivalent of the peacock's tail – a conspicuous and potentially expensive display which demonstrates the quality of the genes carried by the bearer of display, and in particular in the case of art, the quality of the genes which created the brain. If so, it might be expected that there will be differences in aesthetic activities and attitudes which are related either to sex itself (in the biological sense) or to gender in the psycho-social sense (and which in the present study we have looked at as the personality dimension of masculinity – femininity, a variable which has been extensively if rather inconclusively examined in the past in

relation to creativity; see Barron and Harrington 1981). However, it should also be said that there are those who dispute the basic tenets of Miller's argument (e.g. Coe 2005).

As well as sex, this study looked at two other demographic factors, age and social class. As mentioned earlier, Bourdieu *et al.* (1991) have argued that class is strongly related to aesthetic activities. There are also many reasons, in practice, why age might be related to aesthetic activities, not least that as people get older so priorities change and experience increases.

## Method

The data in this study were collected as part of a large undergraduate laboratory class at University College London. The laboratory in its present format has been running for several years now, and studies from the laboratory on other topics have been published elsewhere (Furnham & McManus, 2004; Furnham, McManus, & Scott, 2003).

### *The laboratory class*

The class runs for 3 successive weeks, and is intended to introduce students to different methods of research into attitudes. Each year, the focus is on a topic that is purposely only vaguely defined, so that students are encouraged to explore the richness of the question and to feel free to follow their own directions. Students are also told that they are not expected to research elsewhere in the scientific literature or on the Internet, but are to treat the question as though they were the very first ones to encounter it. For the January 2004 class, the question was, 'What is art about?'

The class was split into 11 groups each with about 10 students who worked together for the next 3 weeks in conjunction with a demonstrator who was usually a graduate student. Week 1 began with students running small focus groups within each group in order to explore the variety of issues and attitudes. The qualitative phase of the class then involved each group dividing into two subgroups who chose an interviewee who was likely to be informative about the issues that had been identified. Between weeks 1 and 2, the groups carried out a semi-structured interview and transcribed it in a standard fashion. During week 2, each group was provided with transcripts of all of the interviews that had been carried out by the class as a whole, and they used these both for developing a grounded theory and to write questions for a quantitative questionnaire study.

The questionnaire, which consisted of a folded sheet of A3 paper (i.e. four A4 sheets), contained 33 attitude questions, each with a common rubric. Each group was asked to write three questions (along with two reserves in case of duplication between groups). No stipulations were made about the content of the questions, and all those produced were clearly within the broad remit of the class. The questionnaire was assembled by the end of the week 2 class, and printed by the day after, when each student collected 12 copies which they were asked to distribute. The answers to the returned questionnaires were typed into a Statistical Package for the Social Sciences (SPSS) data file, which was e-mailed to ICM the day before the week 3 class, and the files were then merged together. At the week 3 class, the students were given an SPSS data file containing all of the data from the entire class, and with their demonstrators they identified questions that could be addressed using the data which related to the issues arising during the focus groups and interviews and from the grounded theory. Students were allowed to write up the class either as a purely qualitative study, a purely quantitative study or as a hybrid report involving both approaches. Irrespective of the

type of report, it was made clear to all students that they had to contribute to both the interview and the questionnaire components of the class or they would lose marks. For the present analysis, only the quantitative data will be considered.

### **The questionnaire**

As well as containing the 33 attitude questions written by the students, which were on pages 2 and 3 of the booklet, the first page of the questionnaire also contained instructions to the participants and a series of 10 questions on demographics, education and social background. Page 4 of the questionnaire contained a specially written set of 17 questions on a range of aesthetic attitudes (see below), a brief (15-item) measure of the Big Five personality dimensions which has been used in several other studies (Furnham *et al.*, 2003; Furnham & McManus, 2004; McManus, Keeling, & Paice, 2004; McManus, Smithers, Partridge, Keeling, & Fleming, 2003), and an 8-item abbreviated version of the Personal Attribute Questionnaire (PAQ) of Spence and Helmreich (1978). The latter contained four of Spence and Helmreich's masculine items (M: items 2, 10, 17 and 19 of the PAQ) and four feminine items (F: items 3, 8, 12 and 15 of the PAQ). Responses to the eight items were summed (with the F items reverse scored), to give an overall measure of masculinity – femininity (Masculinity minus Femininity;  $M - F$ ). For simplicity, in the rest of this paper, we will refer to the measure as masculinity, higher scores indicating greater masculinity and lower scores indicating greater femininity. Pages 1 and 4 of the questionnaire were written and prepared for the students by author ICM.

### **Participants**

Each undergraduate in the class was asked to find 12 participants who would complete the questionnaire, and it was said that these should be students, with the term not being rigorously defined. A stratified sampling scheme was used, each undergraduate obtaining completed questionnaires from three male participants studying science subjects, three female participants studying science subjects, three male participants studying non-science subjects and three female participants studying non-science subjects (with the precise definition of science being left to the undergraduates in the class). Apart from the stratification, students in the class were asked to be as broad as possible in finding the participants, with it being emphasized that participants need not just be from University College London (UCL), but could include friends, relations and colleagues, and they specifically should not be psychology undergraduates at UCL. The intention was therefore to obtain a large convenience sample for the purposes of data exploration. There was no expectation that the sample should be representative of the population as a whole, and the present paper should be interpreted with that limitation in mind. The data, however, are probably adequate for exploring the interrelationships and correlations between measures, but care should be taken in the interpretation of absolute percentages and means. A concern with our sampling method is either that some data may have been fabricated, or that some subjects may inadvertently have been included twice, and Appendix B presents analyses to assess such possibilities and their likely impact.

### **Statistical analysis**

Conventional statistical analysis used SPSS v11.5. Structural equation modelling (SEM) was carried out using LISREL 8.52. Data for SEM were prepared in SPSS, with missing

values replaced using the expectation maximization (EM) algorithm, before being transferred to LISREL, where all variables were set as continuous and censored from above and below.

## Results

This section begins with a description of the participants and their educational and social background, and then goes on to describe the aesthetic activities which they undertake and the correlation of those activities with the demographic and personality measures. The aesthetic attitudes are then described along with their relationship to activities and the other measures. Finally, a structural equation model is developed which summarizes the main relationships that have been found.

### Participants

Questionnaires were available from 1,199 participants, 1,071 (89.3%) of whom had complete information on all measures and the remainder of whom were missing occasional pieces of information. Altogether, 563 pieces of information were missing out of a possible total of 101,915 (0.55%).

### Demographics and educational background

There were 602 male (50.2%) and 597 female (49.8%) participants, reflecting the stratified sampling scheme. Most participants were in their early twenties (mean = 21.62, *SD* 4.61, median = 19, mode = 20, range = 16–65) although 290 (24.2%) were in their teens, 34 (2.8%) in their thirties, 14 (1.2%) in their forties, 6 (1.2%) in their fifties and 1 (0.1%) in their sixties. The highest level of education thus far achieved was GCSE for 50 (4.2%), A-levels for 226 (18.8%), undergraduate for 841 (70.1%) and postgraduate for 81 (6.8%). Of the participants, 530 (44.2%) had a higher level of educational achievement in science subjects, 486 (40.5%) had a higher level of achievement in non-science subjects and 183 (15.3%) had equivalent levels in science and non-science subjects. Participants self-classified their present subject of study into the groups used by UCAS (Universities and Colleges Admissions Service: see [www.ucas.ac.uk](http://www.ucas.ac.uk)); 180 were studying medical science, 112 biological science, 92 physical science, 64 mathematics, 65 engineering, 27 architecture, 95 social studies, 90 business studies, 10 media studies, 66 languages, 256 humanities, 118 creative arts and 7 education, with 17 being unable to classify. Information was also available on the highest level of art and music education: 400 (33.4%) participants had studied art to O-level/GCSE, 161 (13.4%) to A-level, 50 (4.2%) to Foundation course level, 84 (7.0%) at undergraduate level and 7 (0.6%) at postgraduate level; 383 (31.9%) participants had studied music to O-level/GCSE, 89 (7.4) to A-level, 14 (1.2%) to undergraduate level and 1 (0.1%) to postgraduate level.

### Social background

Two questions were asked in which participants classified the jobs of their father and mother on the (pre-2000) Registrar-General's scale. Of these, 551 (46.0%) classified their father's job as I: professional, 318 (26.5%) as II: intermediate, 189 (15.8%) as III: skilled, 39 (3.3%) as IV: semi-skilled and 30 (2.5%) as V: unskilled; 72 (6.0%) were missing or

unclassifiable. Equivalent figures for mothers were 237 (19.8%), 423 (35.3%), 184 (15.3%), 74 (6.2%) and 32 (2.7%), with 249 (20.8%) missing or unclassifiable. For convenience, the maternal and paternal codes were merged together by allocating a code based on the higher of the two classes if a code was available for both, and otherwise using whatever information was available. On that basis, a social class was available for 1,162 participants, 616 (51.4%), 354 (29.5%), 145 (12.1%), 29 (2.4%) and 18 (1.5%) in social classes I, II, III, IV and V, respectively.

### **Reliability of scales**

The abbreviated Big Five measures of N, E, O, A and C had  $\alpha$  coefficients of .52, .53, .54, .53 and .53; the values are relatively low, as they are each based on only three questions, but are more than adequate for assessing population-level correlations given the large sample size in the study. Alpha for the 8-item masculinity scale was .621.

It might be argued that these values of reliability are below those conventionally regarded as necessary in psychometric work (and values of 0.7 are sometimes quoted). However, that ignores several other factors, as we have discussed previously (Fox, McManus, & Winder, 2001). The purpose of research such as this is to have sufficient statistical power to find true correlations of a reasonable size which are likely to be present in the population. Long, and hence more reliable, instruments achieve that in a relatively small number of subjects, but at the price both of subjects taking a long time to complete the study and of becoming bored or not completing the study. A shorter instrument, despite its lower reliability, will have similar or even greater power than a longer questionnaire, as long as the sample size can be made proportionately greater, as here. There is then the additional advantage, again as here, that a wider, more representative sample of the population can be sampled. Fortunately, the effects of differences in reliability are well quantified (Ghiselli, Campbell, & Zedeck, 1981), and correlations disattenuated for reliability can readily be calculated using standard structural equation modelling programs.

### **Aesthetic activities**

The questionnaire asked about 17 separate activities, 16 of them being rated on a common, temporally anchored, 7-point scale and the remaining one (watch television) on a separate temporally anchored scale. Table 1 shows the proportion of answers on each of the scales. An exploratory factor analysis was carried out using principle component analysis, identification of factors by a scree-slope criterion and varimax rotation. The first 10 eigenvalues were 4.17, 1.61, 1.45, 1.23, 1.13, .92, .84, .81, .76 and .64, and on that basis five factors were extracted, which were readily identified. Factor scores were not however calculated, but instead, summary scores were created from the raw variables identified by the factor analysis. Calculation of summary scores has the advantages that the summary scores can relate more straightforwardly to the original measures, that they can be correlated, and that the two measures which were awkward in the factor analysis (television and cinema) can be handled more naturally. The first factor loaded strongly on going to the theatre, going to classical or modern dance, and acting, and these measures were combined to form the performance art summary score. The second factor loaded strongly on going to museums or art galleries, reading about art and drawing or painting, and these measures were combined to form the visual arts summary score. The third factor had high loadings on reading novels, reading

**Table 1.** Frequencies of the various aesthetic activities expressed as percentages of respondents

	Percentage ( <i>N</i> = 1,194–1,199)						
	Every day (6)	A few times a week (5)	Once a week (4)	A few times a month (3)	Once a month or less (2)	A few times a year (1)	Never (0)
Listen to popular music	64.5	22.6	5.0	3.3	2.1	1.3	1.3
Listen to classical music	8.8	18.3	10.1	17.2	9.1	17.5	19.0
Go to pop concerts/discos	2.2	10.8	12.8	19.1	14.6	25.3	15.2
Go to classical music concerts/opera	0.6	1.2	2.6	6.4	8.7	29.9	50.7
Play a musical instrument	7.9	8.5	5.3	7.4	7.4	16.5	47.1
Go to museums or art galleries	0.5	3.6	7.3	15.1	19.1	41.1	13.4
Read about art in newspapers, magazines or books	7.6	14.8	12.7	17.9	15.3	17.2	14.6
Draw or paint	8.8	8.0	6.4	10.6	10.7	22.9	32.6
Read a novel	14.1	15.6	10.3	15.3	17.3	19.3	8.2
Read non-fiction books (not for work or study)	9.0	10.3	10.5	17.4	16.2	24.5	12.0
Read poetry	2.1	4.7	6.5	14.0	12.7	27.8	32.2
Go to the cinema	0.6	4.7	13.5	40.0	27.8	11.7	1.8
Go to the theatres (plays/musicals, etc.)	0.2	0.8	2.8	12.6	21.0	46.7	16.0
Act or otherwise take part in theatre	0.6	1.8	1.8	3.8	4.5	16.2	71.3
Go to classical or modern ballet/dance	0.5	0.4	2.1	2.7	3.8	23.6	66.9
Go dancing (any form)	3.3	13.5	16.7	19.0	13.9	11.3	22.3
	4+ hours (6)	2–4 hours (5)	1–2 hours (4)	1 hour or less (3)	2–3 times a week (2)	Once a week (1)	Less often (0)
Watch television	8.8	23.7	27.9	17.9	10.5	5.0	6.2

non-fiction and reading poetry, and these were combined to form the literature summary score. The fourth factor had high loadings on listening to classical music, going to classical music concerts or opera and playing a musical instrument, and these measures were combined to form the classical music summary score. Finally, the fifth factor had high loadings on listening to pop music, going to pop concerts or discos and going dancing, and these measures were combined to form the popular music summary score. Alpha reliabilities of the pop music, classical music, visual arts, literature and performance arts summary scores were .53, .48, .57, .70 and .68, respectively. Two of the measures did not fit well into this scheme. Going to the cinema loaded positively with both the performance art measures and the visual art measures, and negatively with the classical music measures; it was therefore decided to keep it as a separate measure. Watching television loaded strongly only with the classical music measures, but the loading was negative which made little obvious conceptual sense, and it also was therefore kept as a separate measure.

The large first eigenvalue for the factor analysis suggests that there could well be a common single factor underlying the 17 measures of aesthetic activity. A simple overall aesthetic activity score was therefore calculated based on the scores for all 17 measures. The theoretical range was from 0 (none of the activities) to 102 (maximum score on all 17 activities). The actual range was from 8 to 79, with a mean of 37.7, median of 36 and mode of 36. The standard deviation was 12.1 and the quartiles were 29 and 46. The score had an  $\alpha$  of .75.

### **Correlates of aesthetic activities**

Correlations were calculated for the relationship of each of the 17 aesthetic activities, and the 5 summary scores, plus the overall score, with 13 background measures, which were 3 demographic measures (sex, age and social class), 6 personality measures (the Big Five measures and masculinity) and 4 measures of educational level and type (overall level, predominantly science education, level of visual arts education and level of music education). Tables 2 and 3 show the simple Pearson correlations, along with their significance levels (which have not been Bonferroni corrected for repeated testing). Some of the background measures are inevitably correlated (see below for structural modelling), and this was taken into account by multiple regression, each activity being regressed on the 13 background measures. Correlations shown underlined in Tables 2 and 3 indicate variables that are significant at the 0.001 level after all of the other background factors have been taken into account. It should be noted that a few simple correlations that are non-significant are nevertheless significant in the regression analysis, probably representing confounding or multicollinearity. These will be considered again in the structural modelling below.

Many of the correlations in Tables 2 and 3 are significant, 80 of the 286 being significant with  $p < .001$  (and one or fewer would be expected by chance alone). Several features are immediately apparent. Openness to experience shows strong, positive correlations with many activities (12), as also to a lesser extent do extraversion (5), conscientiousness (9) and agreeableness (6), although neuroticism shows no correlations at all with the activities. Among the educational measures, level of education shows some correlations, but science education shows many negative correlations with activities, whereas music and art education show many positive correlations with activities. Finally, sex and age show a number of correlations, whereas class shows only a single correlation significant at the .001 level. Different activities also

**Table 2.** Pearson correlations of the various aesthetic activities with the demographic, personality and educational measures

	Listen to popular music	Listen to classical music	Go to pop concerts/discos	Go to classical music concerts/opera	Play a musical instrument	Go to museums or art galleries	Read about art in newspapers, magazines or books	Draw or paint	Read a novel	Read non-fiction books (not for work or study)	Read poetry	Go to the cinema	Go to the theatre (plays/musicals, etc.)	Act or otherwise take part in theatre	Go to classical or modern ballet/dance	Go dancing (any form)	Watch television
Male sex	-.015	-.026	-.004	-.058*	.044	-.023	-.035	-.016	-.129***	.012	-.120***	.002	-.005	-.028	-.143***	-.063*	.053
Age	-.151***	.083**	-.199***	-.003	-.053	-.015	.062*	-.040	-.014	.029	-.023	-.081**	.002	-.084**	-.015	-.184***	-.016
Higher social class	.039	.100***	.082**	.044	.042	.039	.045	.035	.062*	.041	.058	.026	.028	.020	.042	.055	-.092**
Neuroticism (N)	-.008	.048	.022	.057*	-.013	.039	.052	.068*	.058*	.049	.059	.012	.051	.057*	.071*	-.031	.038
Extraversion (E)	.118***	.002	.115***	-.020	-.058*	.027	.043	.016	-.052	-.061*	-.011	.082**	.059*	.023	.031	.206***	.000
Openness (O)	.008	.270***	.003	.034	.106***	.205***	.217***	.137***	.215***	.158***	.240***	-.035	.058*	-.042	.023	.000	-.169***
Agreeableness (A)	.036	-.031	-.061*	-.118***	-.058*	-.017	-.027	-.084**	.022	-.047	-.034	-.064*	-.056	-.154***	-.074*	-.169***	-.041
Conscientiousness (C)	.000	-.092***	-.100***	-.041	-.116**	-.058*	-.041	-.117***	-.055	-.029	-.113***	.003	-.021	-.066*	.001	-.041	-.008
Masculinity	-.027	-.050	-.045	-.011	-.012	.003	-.071*	-.021	-.123***	-.020	-.059*	.078**	.016	.021	-.041	.003	.018
Educational level	.035	.142***	.052	.070*	.053	.107	.122***	.031	.111***	.049	.057*	-.039	.046	-.022	.001	-.038	-.128***
Science education	-.047	-.101***	-.056	-.084**	-.085**	-.243***	-.262***	-.249***	-.138***	-.069*	-.234***	-.053	-.149***	-.113***	-.103***	-.100***	-.013
Art education	.014	.093***	.006	.071*	.061*	.351***	.340***	.477***	.064*	-.021	.165***	.105**	.100***	.046	.101***	.037	-.002
Music education	-.052	.186***	.038	.233***	.355***	.142***	.123***	.129***	.091**	.064*	.125***	.023	.142***	.136***	.125***	.006	-.093***

Underlined correlations are significant with  $p < .001$  after multiple regression to take into account the effect of all other background factors. \* $p < .05$ ; \*\* $p < .01$ ; \*\*\* $p < .001$ .

**Table 3.** Pearson correlations of the overall aesthetic activity score and the five subscales with the demographic, personality and educational measures

	Overall aesthetic activity score	Popular music summary score	Classical music summary score	Visual arts summary score	Literature summary score	Performance art summary score
Male sex	-.071*	-.041	-.009	-.030	-.099***	-.094***
Age	-.092**	-.254***	.014	.000	-.012	-.044
Higher social class	.087**	.083**	.086**	.049	.070*	.039
Neuroticism (N)	.081**	-.007	.036	.069*	.072*	.077**
Extraversion (E)	.056	.213***	-.036	.036	-.053	.048
Openness (O)	.216***	.007	.204***	.228***	.260***	.014
Agreeableness (A)	-.091**	.000	-.082**	-.058*	-.023	-.124***
Conscientiousness (C)	-.126***	-.084**	-.121***	-.093***	-.079**	-.040
Masculinity	-.062*	-.033	-.036	-.041	-.087**	-.001
Educational level	.090**	.017	.121***	.102***	.091**	.009
Science education	-.281***	-.101***	-.122***	-.314***	-.180***	-.156***
Art education	.267***	.027	.101***	.494***	.083**	.104***
Music education	.240***	.005	.349***	.162***	.116***	.172***

Underlined correlations are significant with  $p < .001$  after multiple regression to take into account the effect of all other background factors. \* $p < .05$ ; \*\* $p < .01$ ; \*\*\* $p < .001$ .

show different patterns of correlations, and these will be returned to later. Of some interest though is that popular music is particularly related to extraversion, whereas classical music is related to openness to experience.

### **Aesthetic attitudes**

An exploratory factor analysis of the 33 attitude questions was carried out using principle component analysis, a scree-slope criterion for assessing the number of factors, and varimax rotation. The first 15 eigenvalues were 3.50, 2.08, 1.65, 1.60, 1.40, 1.21, 1.16, 1.12, 1.08, 1.02, .99, .97, .93, .90 and .89, and a scree-slope suggested there were five factors in the data, which together accounted for 31.0% of the total variance. The first factor was labelled *anti-art*, and those with high scores agreed that government funding for art should be redistributed to other services (loading = .581), that all kinds of art should be censored (as films are) (.395), that science is more important than art for our society (.571), and that today's artists owe their success more to good marketing and publicity rather than talent (.472), and they disagreed with statements that modern art is authentic (−.502), and that art can be created from any medium as long as the intention is to make art (−.441). The second factor was labelled *aesthetic inclusivity*, and high scorers saw art as being broadly defined, agreeing that science can be art (loading = .447), that sport is an art (.699), that a child's drawing is art (.592), that cordon bleu chefs are artists (.664), and they agreed with the questions, 'Do you think the talents of Picasso can be compared on equal standing to those of the Beatles?' (.453). The third factor was labelled *emotion and understanding*, those with high scores agreeing that one has to understand the emotions of the artist in order to appreciate the work (.601), that the meaning behind art has to be obvious for it to have value (.530), and that one needs to understand the background information of a piece of art to appreciate it properly (.487). In addition, high scorers on this factor also agreed that art had to be controversial to make an impact (.466), that in schools the arts are more important than the sciences (.397), and that one has to like something to consider it as art (.432). The fourth factor was labelled as *aesthetic relativism*, with high scorers agreeing that their appreciation of art has been influenced by academic tuition (.642), by their education (school, college and university) (.589) and by their upbringing (.457), that the media have a powerful influence over what is considered as good art (.467), that the meaning of a piece of art changes with time (.508), that art reflects the attitudes of society (.356) and that art is class restrictive (.370). The fifth factor was difficult to identify but has been labelled as *aesthetic quality*. Those with high scores thought that art required skill (.529), that art loses its value if mass produced (.354), that it must provoke an emotional response (.421), that artistic talent is innate (.434), that children should be exposed to art through compulsory school trips to galleries, museums, theatres, etc. (.430), and that the ability of a piece of art to withstand the test of time is a better indicator of quality than its monetary value (.444). Two of the 33 questions have not thus far been listed in these five factors. One question which asked whether good art is determined by its popularity loaded on four of the five factors, positively on 1 and 3, and negatively on 2 and 5. The other question, which had the lowest communality (.083), asked whether galleries display a representative collection of art and artists.

Although five factors represent the data well, for later convenience in model fitting (and also by analogy with the single aesthetic activities score), a single measure was also computed for the entire set of aesthetic attitudes, using principle component analysis. This overall factor, labelled *aesthetic attitude*, related clearly to the five aesthetic

attitude factors, correlating positively with factor 2 (aesthetic inclusivity;  $r = .534$ ), factor 4 (aesthetic relativism,  $r = .342$ ) and factor 5 (aesthetic quality,  $r = .204$ ), and negatively with factor 1 (anti-art,  $r = -.627$ ) and factor 3 (emotion and understanding,  $r = -.403$ ). High positive scores on aesthetic attitude therefore indicate individuals who believe art is inclusive, that definitions are relativistic and culturally constrained, and that quality matters and is indicated by the passage of time, and who disagree with simplistic anti-art ideas, and ideas that emotion and understanding are the only basis for art. By using the raw items (and reverse scoring items as appropriate), an estimate of  $\alpha$  could be calculated as .68.

### **Correlates of aesthetic attitudes**

Table 4 shows the Pearson correlations of scores on the 5 aesthetic attitude factors with the 13 demographic factors and also with the 5 aesthetic activity summary scores and with 'watching television' and 'going to the cinema'. Of the 100 correlations, 23 are significant with  $p < .001$ . Some of the correlations may, however, be significant because of confounding between background variables, and therefore, as in Tables 2 and 3, correlations which are underlined indicate those variables that are significant predictors of aesthetic attitudes at the  $p < .001$  level after the other variables have been entered into the regression equation. As with Tables 2 and 3, a few variables become significant in the regression equation, and discussion of these will be left until the structural modelling (below).

All of the aesthetic attitudes are correlated with personality measures, with openness to experience correlating with all of the attitudes, agreeableness correlating with three of them, and extraversion with two of them. Of interest is that neither neuroticism nor conscientiousness show any significant correlations. Educational measures are correlated with attitudes, although mainly with factor 1 (anti-art) and factor 4 (aesthetic relativism). Aesthetic activities also correlate with four of the five aesthetic attitudes, factor 1 (anti-art) in particular being correlated with lower activity on all of the summary scores. Only factor 5 (aesthetic quality) did not relate at all to aesthetic activities.

### **Structural modelling**

Tables 2, 3 and 4 have presented a large number of correlations which are not easy to interpret. In addition, the regression analyses, where significance in Tables 2, 3 and 4 is indicated by underlining, suggest that some of the simple correlations are significant because of confounding, and that there are substantive effects which have been masked due to correlations between the measures. The problem of interpretation of so many correlations is best approached through structural equation modelling.

### **Causal ordering**

The determination of causal order *a priori* is never easy (Davis, 1985; Kenny, 1979; Pearl, 2000), although very often reasonable assumptions can be made that constrain the models. Nevertheless, even if a causal model is wrongly specified in some of its details, it still allows an overall picture of the data, taking many background factors into account in a principled fashion. The provision of the correlation matrix (see Appendix A) also allows other researchers to rework the models making different assumptions, and thereby testing the model further.

**Table 4.** Pearson correlations between the five aesthetic attitudes and the overall measure of aesthetic attitude, and the demographic, personality, educational and aesthetic activity measures

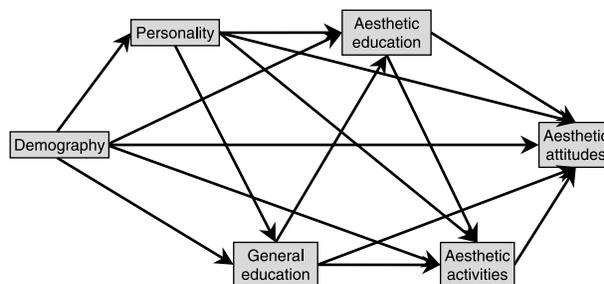
	1. Anti-art	2. Aesthetic inclusivity	3. Emotion and understanding	4. Aesthetic relativism	5. Aesthetic quality	Aesthetic attitude
Male sex	.095***	.059*	.020	-.024	-.045	-.054
Age	.054	-.016	.015	<b>.045</b>	.048	-.024
Higher social class	.022	.007	-.026	.018	.090**	.024
Neuroticism (N)	.031	.044	.064*	.032	.002	-.009
Extraversion (E)	-.152***	.098***	-.001	.056	.067*	.181***
Openness (O)	-.239***	.122***	-.105***	.220***	.108***	.357***
Agreeableness (A)	-.153***	.013	-.155***	.005	.112***	.193***
Conscientiousness (C)	-.05	-.010	.009	-.017	.024	-.006
Masculinity	.094***	-.076**	-.027	-.040	-.070*	-.117***
Educational level	-.101***	.055	-.058*	.095***	.062*	.162***
Science education	.253***	.056	-.073*	-.092***	-.038	-.139***
Art education	-.298***	.003	.027	.068*	-.003	.200***
Music education	-.138***	.068*	.051	.055	.000	.120***
Popular music summary score	-.189***	.046	-.014	.053	.005	.166***
Classical music summary score	-.175***	.066*	.026	.064*	.059*	.169***
Visual arts summary score	-.372***	.054	.019	.128***	.039	.304***
Literature summary score	-.159***	-.005	.033	.073*	-.001	.108***
Performance art summary score	-.209***	-.046	.135***	-.006	-.004	.048
Go to the cinema	-.075**	-.072*	.103***	-.032	.043	-.036
Watch television	.040	-.101***	.025	-.078**	-.050	-.129***
Overall aesthetic activity score	-.335***	.021	.064*	.088**	.031	.230***

Underlined correlations are significant at  $p < .001$  after multiple regression to take into account the effect of all other background measures and activities (with the exception of the overall activity score). \* $p < .05$ ; \*\* $p < .01$ ; \*\*\* $p < .001$ .

The 25 variables included in the structural equation model were divided into several subsets in terms of their likely causal ordering. The broad structure of the model is shown in Figure 1. The major theoretical interest was in the seven measures of aesthetic activities and their relationship to the five aesthetic attitudes. Since attitudes primarily reflect a current view of a phenomenon, whereas activities are the integrated sum of behaviour over the past year or two, it was assumed for the present analysis that activities were causally prior to attitudes, rather than vice versa. Education typically occurs earlier in life than the activities being described, and it was therefore seen as prior to both activities and attitudes. For convenience it was divided into general education (the two measures of overall educational level, and the extent to which education was primarily in science), and aesthetic education (the two measures of education in music and education in the visual arts). General education was assumed to be prior to aesthetic education, although that is not a strong assumption. There were six measures of personality (the Big Five, plus masculinity), and since personality typically assesses traits rather than states, these were put prior to education, since it was presumed they were more likely to influence education than to be influenced by education. Finally, the three demographic measures (age, sex and social class) were placed prior to all other measures since they inevitably are exogenous, influencing but not being influenced by other measures.

### Structural model fitting

Maximum likelihood fitting was used. Within each of the six groups of variables (demography, personality, etc., in Figure 1), a saturated model was fitted within the PSI matrix of LISREL (see Appendix A for correlations). Casual links between the groups of variables were fitted using the BETA matrix of LISREL and, in the initial, saturated model, any variable to the left of another variable could influence that variable (e.g. any measure of general education could influence any measure of aesthetic education, aesthetic activities or aesthetic attitudes). Non-significant beta links were systematically dropped from the model, removing the smallest first, until all beta links remaining were significant with  $p < .05$  (i.e.  $|t| > 1.96$ ). There are many indices of goodness of fit of a LISREL model (Loehlin, 1992b; Maruyama, 1998) and different researchers have different preferences. We chose to assess overall goodness of fit of the model using the chi-square goodness of fit statistic, the goodness of fit index (GFI) and the adjusted goodness of fit index (aGFI). Values of the GFI and aGFI greater than 0.9 are usually regarded as indicating a good fit to the data (Kelloway, 1998).



**Figure 1.** The broad structure of the theoretical model. Variables are divided into six groups, which are located in postulated causal order from left to right. In the saturated model, which is shown, any variables to the left can have a causal influence on any other variables to their right.

### **The fitted model**

The saturated model had 249 BETA parameters and 76 PSI parameters. In the final fitted model, there were still 76 PSI parameters, but only 97 BETA parameters, leaving 152 degrees of freedom for the error term. The fitted model had a  $\chi^2$  of 176.34 (152 *df*,  $p = .0861$ ), indicating a good fit of the model to the data. The GFI was 0.989 and the aGFI was 0.976. Overall, the fit of the model was therefore excellent.

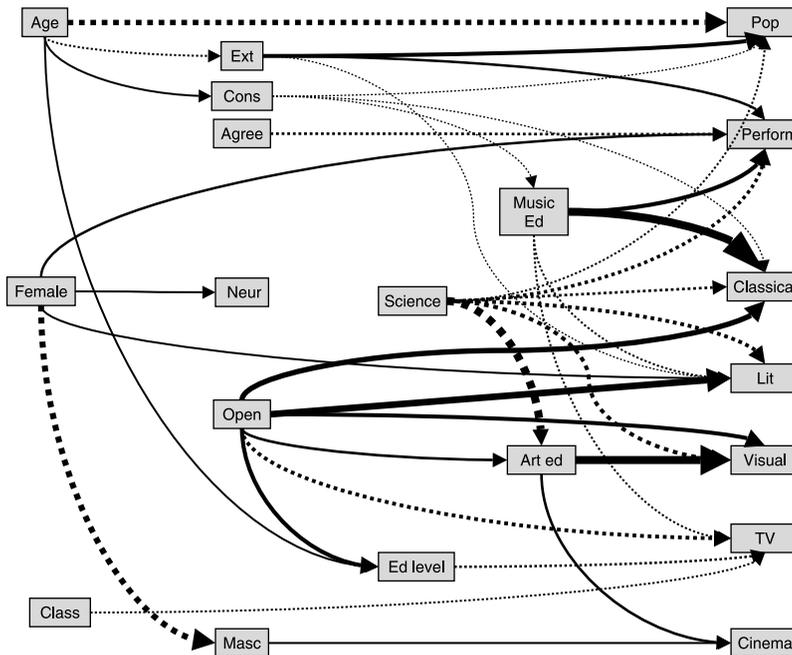
Of the 97 significant BETA parameters, 35 were significant with  $p < .001$ , 21 with  $.001 < p < .005$ , 11 with  $.005 < p < .01$ , and 30 with  $.01 < p < .05$ . Although a path diagram is conceptually the easiest way to represent a structural model, that is clearly going to be impractical with 97 paths connecting 25 variables. The results of the SEM will therefore be presented in two parts. Drawing a single path model is particularly complicated by the portions connecting the seven aesthetic activities to the five aesthetic attitudes, and therefore two separate diagrams will be presented. Less significant paths with a significance of  $.005 < p < .05$  are also omitted from the diagram, and instead are commented on in the text; although some of these paths may be of theoretical interest, it is also possible that some represent type I errors.

### **Demography, personality, education and aesthetic activities**

Figure 2 shows the path diagram for those variables in which  $p < .005$ . The thickness of the lines is proportional to the size of the path coefficient, and negative paths are indicated by dashed lines. Most variables are self-explanatory; however, it should be noted that sex has been written as female, a positive path coefficient indicating that women are more likely to score highly, and social class has been scored so that high social class scores more highly (i.e. the opposite of the Registrar-General's scheme in which the highest social class scores 1 and the lowest scores 5).

Although the diagram is complicated, several features become apparent. Most striking is the central role of openness to experience, and the comparative lack of influence of the demographic variables, especially social class, and of masculinity and trait neuroticism. Perhaps not surprisingly, specific education influences activities, music education predicting classical music and performing arts (although having neither a negative nor a positive effect on popular music). In contrast, art education predicts visual arts and cinema (and less significantly, there is a negative effect on television,  $\beta = 0.071$ ,  $p < .05$ ). General educational level has little effect on activities, showing only a negative effect on television (and a less significant positive effect on classical music,  $\beta = 0.062$ ,  $p < .01$ ). However, type of general education has multiple effects, those with a science education reporting lower levels of activity in popular music, classical music, performing arts, literature and visual arts, with additional indirect effects on visual arts and cinema because of a lower level of art education (and there was also a less significant negative effect of a science education on music education,  $\beta = -0.057$ ,  $p < .05$ ).

Personality has a range of effects on activities, some of which are indirect. Openness to experience is associated with more art education and with a higher education level, and a lower level of conscientiousness is associated with more music education. Although in the path diagram no paths are shown from neuroticism, there were less significant paths from neuroticism, with a negative path from neuroticism to science ( $\beta = -0.072$ ,  $p < .05$ ), and a positive path from neuroticism to art education ( $\beta = 0.066$ ,  $p < .05$ ). Openness to experience had the greatest impact on activities, with direct positive effects on classical music, literature and visual arts, and a negative effect on television, and in addition, there are indirect effects via education level, as well as a less significant negative



**Figure 2.** Path diagram showing the relationship of the demographic, personality and educational measures to the overall summary score of activities (aesthetic activities). Paths are only shown for which  $p < .005$ ; less significant paths with  $.005 < p < .05$  are discussed in the text. Path coefficients are not shown, as the figure is already very complicated, but the thickness of paths is proportional to the size of the simple path coefficients, and negative paths are shown as dashed lines. Variables at the same causal level are shown vertically above one another and, for simplicity, correlations between those variables are not shown but can be seen in the tables.

path from openness to science ( $\beta = -0.073, p < .05$ ). Extraversion showed several positive influences, on pop music and performing arts (and also a less significant positive effect on cinema,  $\beta = 0.059, p < .05$ ), and a negative effect on literature. Conscientiousness has several influences, lower levels being associated with more pop music and classical music (as well as an indirect effect via music education), and in addition, there are less significant negative effects on visual arts ( $\beta = -0.056, p < .05$ ) and on literature ( $\beta = -0.068, p < .01$ ). Agreeableness has only one influence in the diagram, lower levels being associated with more activity in the performing arts, and in addition, there are less significant negative effects on classical music ( $\beta = -0.071, p < .01$ ) and on visual arts ( $\beta = -0.055, p < .05$ ). Masculinity had only one effect in the diagram, higher masculinity being associated with more cinema going; in addition, there was also a less significant negative effect on music education ( $\beta = -0.056, p < .05$ ).

The demographic measures had several effects, both direct and indirect on activities. Not surprisingly, increasing age was associated with a declining interest in popular music, and there was also a less significant negative direct effect of age on cinema going ( $\beta = -0.066, p < .05$ ). Age also had indirect effects on activities via its negative effect on extraversion, and its positive effect on conscientiousness and education level. Being female had direct positive influences on the performing arts and literature (and there was also a less significant negative effect on television,  $\beta = -0.065, p < .05$ ), and there were also indirect effects via reduced masculinity and increased neuroticism (as well as

a less significant positive effect upon agreeableness ( $\beta = -0.078, p < .01$ ), and a less significant negative effect upon extraversion ( $\beta = -0.072, p < .05$ ). Higher social class had only one effect in the diagram, a negative effect of watching less television, but there were also several less significant effects, both positive (on openness,  $\beta = 0.073, p < .01$ ; on extraversion,  $\beta = 0.074, p < .01$ ; on educational level,  $\beta = 0.075, p < .01$ ; and on classical music,  $\beta = 0.061, p < .01$ ) and negative (on conscientiousness,  $\beta = -0.065, p < .05$ ).

### **Aesthetic attitudes**

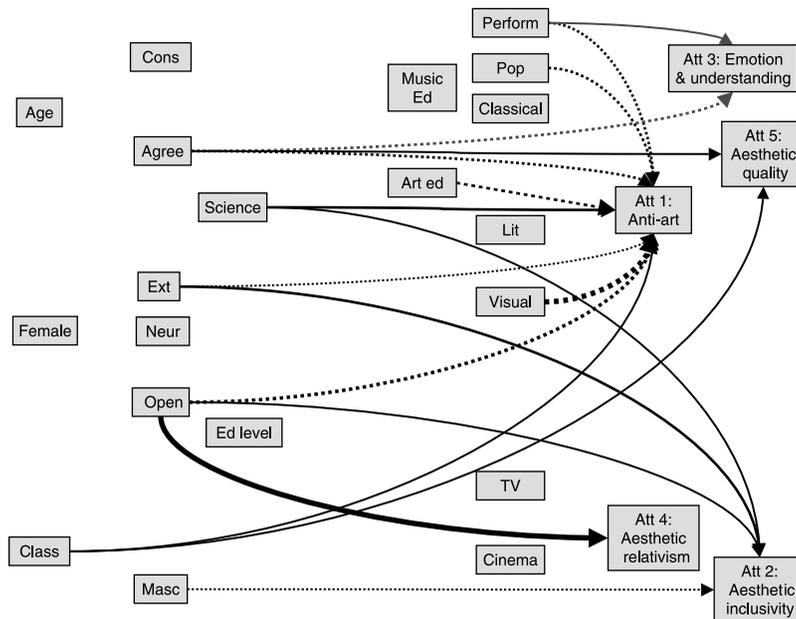
The path diagram in Figure 3 is not a complete path diagram but, as explained earlier and to avoid an unduly complicated diagram, only contains direct paths onto the five aesthetic attitudes which are shown in bold on the right-hand side of the diagram. Any indirect links on to these variables are present in Figure 2, and can be read from there. As with Figure 2, paths in Figure 3 are only included if  $p < .005$ , and the width of paths is proportional to the magnitude of the path coefficient (and are directly comparable to those in Figure 2).

Three things are immediately apparent: first, there are relatively fewer paths than in Figure 2; second, it is the anti-art factor that is particularly being influenced by other variables; and third, that social class and agreeableness play a more prominent role than in Figure 2.

Aesthetic activities influence some of the aesthetic attitudes, and that is particularly the case for factor 1 (anti-art), those reporting more interest in popular music, the visual arts or performance arts having lower scores (i.e. being less anti-art). The only other path on the diagram from activities to attitudes, is a positive link from performing arts to factor 3 (emotion and understanding), although there was also a less significant positive link to factor 3 from cinema ( $\beta = 0.061, p < .05$ ). Other less significant links included three onto factor 2 (aesthetic inclusivity), one of which was positive, from visual arts ( $\beta = 0.062, p < .05$ ), and two of which were negative, from cinema ( $\beta = -0.080, p < .05$ ) and from television ( $\beta = -0.072, p < .05$ ). There were also three less significant links onto factor 5 (aesthetic quality), two of which were positive, from classical music ( $\beta = 0.066, p < .05$ ) and cinema ( $\beta = 0.063, p < .05$ ), and one of which was negative, from literature ( $\beta = -0.066, p < .05$ ). Finally, there was also a single positive less significant link onto factor 4 (aesthetic relativism), from visual arts ( $\beta = 0.062, p < .05$ ).

The educational variables particularly influenced factor 1 (anti-art), with a negative effect from art education, and a positive effect from science. Science also had a positive effect upon factor 2 (aesthetic inclusivity), and there was also a less significant positive link from music education ( $\beta = 0.061, p < .05$ ). Science also had less significant negative links on to factor 3 (emotion and understanding) and factor 4 (aesthetic relativism),  $\beta = -0.065, p < .05$  and  $\beta = -0.060, p < .05$ , respectively. Finally, there was also a less significant positive link to factor 4 (aesthetic relativism) from education level ( $\beta = 0.060, p < .05$ ).

All of the aesthetic attitudes were influenced by personality variables, with openness to experience affecting factors 1, 2 and 4 (see diagram), and also having less significant links to factor 3 ( $\beta = -0.089, p < .01$ ) and factor 5 ( $\beta = 0.086, p < .05$ ). Agreeableness had negative links to factors 1 and 3, and a positive link to factor 5, and extraversion had a positive link to factor 2, and a negative link to factor 1. Neuroticism had a single, less significant positive link to factor 1, and conscientiousness had no links of any sort. Finally, masculinity had a negative link to factor 2, and also a less significant positive link to factor 1 ( $\beta = 0.074, p < .01$ ) and a less significant negative link to factor 5 ( $\beta = -0.062, p < .05$ ).

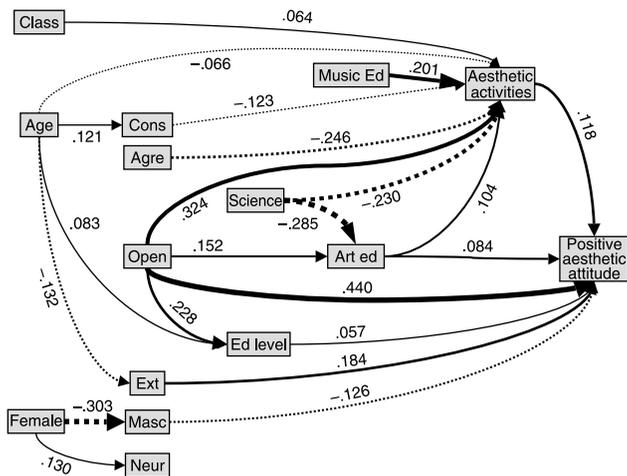


**Figure 3.** Path diagram showing the direct influences of the demographic, personality, educational and aesthetic activities on the five aesthetic attitude measures. Paths are only shown for which  $p < .005$ ; less significant paths with  $.005 < p < .05$  are discussed in the text. Path coefficients are not shown, in order to reduce complexity, but the thickness of paths is proportional to the size of the simple path coefficients, and negative paths are shown as dashed lines. Variables at the same causal level are shown vertically above one another, with the exception of the five aesthetic attitude measures which are slightly displaced horizontally for clarity. Correlations between variables at the same level are not shown but can be seen in the tables. Indirect influences on aesthetic attitudes can be seen by combining Figure 2 with Figure 3.

The only links in the diagram from demographic factors were from social class, which had positive links to factor 1 and factor 5. There were also two less significant paths from age to factor 2 ( $\beta = 0.072$ ,  $p < .05$ ), and from male sex to factor 5 ( $\beta = 0.056$ ,  $p < .05$ ).

Figures 2 and 3 are complex to read. To clarify matters, and to emphasize the important features of the relationships, Figure 4 shows *all* of the background variables, but only the single overall score of aesthetic activities and only the single overall attitude score for aesthetic attitudes. The identification of significant paths followed the same strategy as with the model described earlier for that in Figures 2 and 3. The overall fit of the model was excellent ( $\chi^2 = 45.378$ , 45 *df*,  $p = .456$ ; GFI = .995; aGFI = .987). Figure 4 has similar conventions to Figures 2 and 3, and only paths with  $p < .005$  are shown. Since Figure 4 is less cluttered than Figures 2 and 3, the size of paths is also indicated not only by path coefficients, and these have also been disattenuated for the unreliability of the various measures.

Although aesthetic activities has a positive influence on aesthetic attitude, the path coefficient of .118 is relatively small. In contrast, there are strong influences of personality on both activity and attitude, with openness to experience having strong direct links both to aesthetic activities (.324) and to positive aesthetic attitude (0.440). The other personality measures are noteworthy for each affecting only aesthetic activity or aesthetic attitude, with extraversion (.184) and low masculinity scores (-.126)



**Figure 4.** Path diagram showing the relationship of the demographic, personality and educational measures to the overall summary score of activities (aesthetic activities), and the overall attitude factor (positive aesthetic attitude). Paths are only shown for which  $p < .005$ . Less significant paths with  $.005 < p < .05$  are discussed in the text. The first figure alongside each path represents the path coefficient disattenuated for unreliability. The thickness of paths is proportional to the size of the path coefficient, and negative paths are shown as dashed lines. Variables at the same causal level are shown vertically above one another, and for simplicity, correlations between those variables are not shown but can be seen in the tables.

determining aesthetic attitude, whereas low conscientiousness ( $-.123$ ) and low agreeableness ( $-.246$ ) influence aesthetic activities. The educational variables likewise have different effects on activities and attitudes, with a science background having a direct effect on aesthetic activities ( $-.230$ ), as also does music education (.201). In contrast, educational level has a direct effect only on positive aesthetic attitude (.057). Art education plays a pivotal role in the middle of the diagram, with direct effects on both aesthetic activities (.104) and positive aesthetic attitude (.084), while being influenced both by a science education ( $-.285$ ) and by openness to experience (.152). The demographic factors have relatively small direct effects on aesthetic activities, from social class (.064) and age ( $-.066$ ), as well as an indirect effect of age via conscientiousness (.121). The demographic factors have no direct effects on aesthetic attitudes, but there are indirect effects via the effect of age on extraversion ( $-.132$ ) and on educational level (.083), and of female sex via masculinity ( $-.303$ ).

As well as the 22 paths significant with  $p < .005$  in Figure 4, there were also 18 less significant paths with  $.005 < p < .05$ . These were: from female sex to extraversion ( $-.101$ ), agreeableness (.100) and to aesthetic activity (.105); from higher social class to extraversion (.093), openness to experience (.077), conscientiousness ( $-.097$ ) and educational level (.070); from neuroticism to science background ( $-.109$ ) and art education (.101); from extraversion to aesthetic activity (.128); from openness to experience to science background ( $-.127$ ); from agreeableness to aesthetic attitude (.098); from conscientiousness to music education ( $-.126$ ); from masculinity to music education ( $-.049$ ); from educational level to art education (.052) and to aesthetic activities (.034); from science background to music education ( $-.056$ ); and from music education to positive aesthetic attitude (.081).

### **Overall comparison of aesthetic activities and aesthetic attitudes**

A visual comparison of Figures 2 and 3, as well as Figure 4, suggests that there are broad differences in the pattern of influences upon attitudes and activities. Whereas education seems to have strong effects upon aesthetic activities, it seems to have less influence upon aesthetic attitudes, whereas personality seems to have more influence upon attitudes. This impression was assessed formally by means of a series of multiple regressions in which the single overall factor of aesthetic attitudes and the overall measures of aesthetic activities were regressed first on the four educational variables, then on the six personality variables and finally on the three demographic variables, and the proportion of variance calculated for each type of variable. Table 5 shows that education accounted for 14.9% of the variance in activities, but only 7.2% of the variance in attitudes, a relative difference of 2.08:1. If the effect of attitudes is partialled out of activities, and the effect of activities is partialled out of attitudes, then education accounts for 11.6% of variance in activities but only 4.1% of attitudes, a ratio of 2.83:1. In contrast, personality accounted for 13.9% of the variance in attitudes, but only 5.6% of the variance in activities, a ratio of 2.48:1 (and after partialling effects of attitude from activities and activities from attitude, the ratio of variance was 12.7–4.5% or 2.82:1). Demographic factors accounted for only a small proportion of the total variance, but there was also a relatively greater impact on aesthetic activities than on aesthetic attitudes (1.5 vs. 0.2% before partialling), a ratio of 7.5:1. A similar picture is found if the same calculations are carried out for each of the seven individual activity scores, or the five attitude factors, and their results averaged; they are not reported further here.

### **Active vs. passive involvement in the arts**

The measures of aesthetic activity asked about both passive involvement (e.g. go to museums or art galleries) and active involvement (e.g. draw or paint). Since there may be systematic differences in active and passive involvement, we looked separately at active involvement in playing a musical instrument, drawing and painting, and acting or otherwise taking part in theatre. Active involvement in the activity was the dependent variable in a multiple regression, and the appropriate passive activities then forced into the equation, after which aesthetic education, general education, personality and demography variables were entered in blocks in a forward entry regression, using  $p = .01$  to reduce alpha inflation. Playing a musical instrument, after taking into account listening to classical music, listening to pop music, going to classical concerts and going to pop concerts, was only predicted by having more music education ( $\beta = 0.307$ ,  $p < .001$ ). Drawing or painting, after taking into account going to museums or art galleries, and reading about art, was predicted by having more art education ( $\beta = 0.329$ ,  $p < .001$ ), and by lower conscientiousness ( $\beta = -0.091$ ,  $p < .001$ ). Acting or taking part in theatre, after taking into account going to theatre, film and ballet, was predicted only by lower scores on agreeableness ( $\beta = -0.110$ ,  $p < .001$ ).

### **Discussion**

This study set out to examine how individuals differ in their consumption of a wide range of what can broadly be termed aesthetic activities and attitudes. The term aesthetic, similar to the term art, is difficult to define, but we have tried here to be fairly catholic in our usage, and the components we have chosen might be described as leisure activities concerned with the life of the mind and focusing on the expression of

**Table 5.** Average percentage of variance in the overall activity measure and the overall attitude in relation to the four measures of education, the six measures of personality and the three measures of demography, calculated using a hierarchical multiple regression

Effect of	Aesthetic activities				Effect of	Aesthetic attitudes			
	Taking into account	Variance (%)	Taking into account	Variance (%)		Taking into account	Variance (%)	Taking into account	Variance (%)
Attitudes (At)	–	5.4	–	–	Activities (Ac)	–	5.4	–	–
Education (Ed)	At	11.6	–	14.9	Education (Ed)	Ac	4.1	–	7.2
Personality (Pr)	At, Ed	4.5	Ed	5.6	Personality (Pr)	Ac, Ed	13.7	Ed	13.9
Demography (Dm)	At, Ed, Pr	1.5	Ed, Pr	1.5	Demography (Dm)	Ac, Ed, Pr	0.1	Ed, Pr	0.2

Note. Analyses are reported separately for each dependent variable either taking the other dependent variable into account, or regressing just on education, personality and demography.

emotion. The novelist Tolstoy (1896/1994), in his *What is art?* emphasized the error of thinking only in terms of high art:

We are accustomed to understand art to be only what we hear and see in theatres, concerts, and exhibitions; together with buildings, statues, poems, and novels. . . [But] all human life is filled with works of art of every kind – from cradle-song, jest, mimicry, the ornamentation of houses, dress, and utensils, to church services, buildings, monuments, and triumphal processions. It is all artistic activity. (Chapter 5, p. 51)

Although far from comprehensive, we hope that our list, by its inclusion of popular music, going to discos, going to cinema, watching television, etc., has started to encompass some of the wider senses of art, although clearly, further work could be done on such topics as involvement in fashion, crafts of all sorts, cooking, interior decoration and so on. We are also aware that there is much variation within each of our categories: cinema, for instance includes a wide range from Hollywood blockbusters, through the subtitled films loosely known as art cinema, to the classics of the silent age; likewise, novels includes everything from thrillers sold on railway bookstalls to *Finnegans Wake*. Elsewhere, McManus (1985) has shown differences between the different types of literature, and it is more than possible these different types of interest in literature would each have different personality and other correlates. Researchers have consistently shown that different personality traits predict different types of art (Furnham & Walker, 2001a, 2001b). The use of a checklist of cultural activities is not new, perhaps the first systematic usage being by Holland and Nichols (1964). Hocevar (1981), in a review of measures of creativity, suggested that perhaps the most defensible method for identifying creativity as such is a checklist of personal aesthetic and craft activities (and Griffin and McDermott (1998) showed that such a checklist correlated strongly with the NEO openness to experience scale, with some interesting differences between different types of activity and different subscales of openness of experience).

We have presented our data as a structural equation model, in which we have made assumptions about the causal ordering of the variables. We acknowledge that such causal ordering is inevitably controversial, and that with cross-sectional data, of the sort described here, it is often near impossible to be entirely confident about the causal ordering. In the absence of longitudinal data, causal order can be specified by making reasonable assumptions about the nature of data (Davis, 1985; Kenny, 1979; Pearl, 2000). Thus, demographic data is necessarily to the left of all the other variables in the analysis since it is determined at birth and does not change during life. Similarly, personality variables are relatively fixed across the life-span (that in large part being both a definition of personality and an empirical finding; Matthews *et al.*, 2003; McCrae & Costa, 2003), and it is also consistent with the Big Five personality factors having genetic components (Loehlin, 1992a). We have chosen to model aesthetic activities as determining aesthetic attitudes, rather than vice versa, partly because aesthetic activities are the integral of activity over a relatively long period of time, whereas attitudes are a description of what the person feels at the present instance. In practice, activities and attitudes are likely to be continually interacting over a period of time, and only longitudinal data will resolve the problem of their precise causal interrelation, which may involve reciprocity. Furnham and Chamorro-Premuzic (2004) found correlations of  $r = .50$  between activities and attitudes. They argued that early exposure to art activities through primary and secondary socialization at home and in the school influences activities which in turn lead to further, voluntary, leisure-based activities. Since all of our causal identifications are necessarily tentative we have presented, in Appendix A, the correlation matrix of the

data, so that interested researchers can rework the model using other assumptions in order to see the effect of those assumptions.

Our study group is relatively homogenous in terms of age, but it is clear from Table 1 that there is still a wide range of participation in the various activities. Individual activities and groups of activities, sometimes for obvious reasons such as specific education, have particular background influences (seen in Figure 2). However, it is also clear that there is an overall tendency for there to be a general factor underlying aesthetic activities, individuals who are involved with one form of Activity typically also being involved with others (the obvious exception being watching television, which is negatively correlated with the other activities). Other studies have also found this (Chamorro-Premuzic & Furnham, 2005a; Furnham & Chamorro-Premuzic, 2004; McManus, 1985). This general aesthetic activity factor, which the vernacular might call being arty, has many influences, which are shown in Figure 4. Specific music and art education have particular influences, perhaps unsurprisingly. Further study later in life would be interesting to assess the enduring aspects of these forms of cultural education. However, it does seem through biographies and autobiographies of talented artists and their critics that art aptitude and interests are formed very early in life. It may therefore be the interest in music or art that causes a person to take up music or art education, rather than vice versa.

Overall educational level had little effect on aesthetic activities (but it must be remembered that our study group is fairly homogenous in that respect). Of far greater interest is the strong influence of a science education (and being stratified our study was well-placed to find such an effect). A science education not only has a large, direct, negative effect on aesthetic activities, but it also has indirect effects due to those with a science education having less art education. Such an effect was not entirely unexpected as there has been a continuing awareness since the 1950s of what C. P. Snow (1964) called 'the two cultures' of science and the arts (and the effect has been explored in more detail elsewhere, see McManus, 2006). To some extent the differences described might themselves be secondary to having chosen particular courses to study, so that, for instance, those studying languages will inevitably read more than those studying biological sciences (and if we had asked about reading popular science, for instance, then the science students may well have scored more highly). Nevertheless, our data also suggest that studying science does have a narrowing effect upon the cultural range of students. In part, that may be due to opportunity cost (if one is doing one thing, science, one cannot also be doing something else, such as going to the theatre). Nevertheless, there does seem a case to answer, as C. P. Snow suggested, that the sciences are, in some direct and specific way, narrowing the cultural range of some students. Certainly, our data do not suggest that such differences between science and other subjects can be explained away in terms of pre-existing personality or other background differences.

This theme was picked up in the extensive work of Hudson (1974), who explained preference for arts or sciences in terms of convergent and divergent thinking. Convergent thinkers are science-oriented, deductive thinkers. They tend to be male, single-minded and analytic. They tend to like music but dislike poetry and avoid close personal relationships. The divergent thinking artist is more interested in people and their emotions, and more liberal and open in their attitudes.

Personality had relatively large effects on aesthetic activities, with the largest effect being due to the dimension of openness to experience. Indeed, all the studies concerned with aesthetic interests, activities and knowledge show that it is openness more than any other trait variable that predicts most, and Kraaykamp and van Eijck (2005) found that openness correlated with 11 of their 12 leisure activities. Furnham

and Chamorro-Premuzic (2004) found openness accounted for between 15% and 33% of the variance, while no other trait variable was significant. Similarly, Chamorro-Premuzic and Furnham (2005b) showed openness accounted for 16% of variance in a measure of art interests. In that study, introversion was also seen to play a part in predicting art recognition. Each of the Big Five measures of personality has six, fairly highly correlated facets (Costa & McCrae, 1992), although the present study has not measured them separately. However their very names, fantasy, aesthetics, feelings, actions, ideas and values, make it more than likely that they will correlate with aesthetic activities, since all encapsulate some components of aesthetics and the arts. Of the three items that we had used in our abbreviated Big Five measure, one, as it happened, was from the aesthetics subscale and two from the ideas subscale. The aesthetics item correlated more highly with the overall aesthetic activities scale ( $r = .393$ ), than did the two items from the ideas subscale (.177 and .212). Future work should undoubtedly look in more detail at the separate facets of openness to experience.

It was perhaps more surprising that conscientiousness and agreeableness also correlated with aesthetic activities, but in each case in a negative direction, those taking part in more activities having lower conscientiousness scores and lower agreeableness scores. Considering each in turn, the low scoring end of the dimension of agreeableness has been described by McCrae and Costa (2003, p. 53) as 'critical, skeptical, . . . tries to push limits, and expresses hostility directly', all of which may be necessary to partaking in the arts. Some artistic objects and activities can seem self-centred and indulgent, they can be shocking and intended to offend or raise awkward questions, they can be violent and pornographic and they can aim to confront emotions, all of which may be offensive to those with high agreeableness scores. Likewise, the low end of the conscientiousness scale, described by McCrae and Costa as 'unable to delay gratification, self-indulgent, eroticises situations, [and] engages in fantasy, daydreams', again describes characteristics which may be linked to consuming and particularly to producing in the arts. Conscientiousness is linked both to conservatism and lower intelligence (Moutafi, Furnham, & Paltiel, 2004). There are many studies that have demonstrated the link between conservative beliefs and very narrow and restricted attitudes towards, and appreciation of, aesthetic activities.

In discussing personality, we should also briefly discuss the fact that in the Big Five neither neuroticism nor extraversion related to the overall measure of aesthetic activity. Both are perhaps somewhat surprising. A conventional view of the artist is as a neurotic individual (Feist, 1999), and the consumers of their products are often also viewed in the same way. Our data found no suggestion of such a link. This, however, is a consistent finding (Furnham & Chamorro-Premuzic, 2004). Likewise, artists often have a public image as extraverts (although it must be conceded that there are also images of them as private, secretive, introspective individuals). Eysenck's typology of the extravert as being 'stimulus-hungry' (Matthews *et al.*, 2003; Powell, 1980) might also suggest that novel aesthetic experiences would be attractive to them. However, our data find no evidence that extraversion relates to the overall measure of aesthetic activity (although there were small correlates with pop music and the performing arts). Other studies have usually found only a modest effect (Furnham & Chamorro-Premuzic, 2004).

We had included masculinity in our study because of recent interest in evolutionary psychology in sex differences in artistic production (Miller, 2000) – most artists throughout history have tended to be males, a difference only slightly diminished in the 20th and 21st centuries. It therefore seemed likely that sex (in the biological sense) or gender (in the psychological sense, as assessed as masculinity) would relate to aesthetic

activities. In fact neither did, at least in relation to the overall aesthetic activity factor. There were, however, some small differences between the five subscales of activity, with females being somewhat more interested in literature and the performing arts, and masculine individuals more likely to go to the cinema (although the type of films watched is not known in our study).

The demographic factors of class and age had small but significant effects on overall aesthetic activity, with it being possible that declining aesthetic activity with age is due to a simple lack of time in older subjects with families, or perhaps a lack of opportunity or mobility, or other constraints such as migration away from the larger cities where much aesthetic activity takes place. The class effect, as was expected, showed that individuals from higher social class families were more likely to be more aesthetically active, perhaps due to childhood learning experiences. Of interest is that such effects are not mediated at all through personality or, particularly, through education, suggesting that an interest in arts derives in part, at least, from home environment, as well as through formal education.

This study attempted to investigate demographic, personality and sex-role attitudes as predictors of aesthetic activities and attitudes. It demonstrated both the power and complexity of the causal pathways, highlighting the comparative influence of some factors over others. The results tend to explain how, when and why certain individuals (open to experience) favour particular forms of education (arts vs. science), which in turn influences their aesthetics tastes and activities. It may be expected over time that these factors strengthen as reciprocal causation occurs in the form of virtuous and vicious cycles. Thus, the divergent thinking, open individual may volunteer for further aesthetic education, indulge aesthetic hobbies and therefore become more knowledgeable and favourable towards art. Equally, the convergent, science-orientated person may shun particular types of art which leads to a lifelong ignorance of such activities.

Only longitudinal studies on a diverse population can analyse the causal details of such processes. While this study has acknowledged various restrictions, it may be seen as a first step to uncovering the complex origin of aesthetics interests, attitudes and activities.

## Acknowledgements

We are very grateful to Dr Jonathan Williams for his assistance in carrying out the data-intensive analysis described in Appendix B.

## References

- Argyle, M. (1992). *The social psychology of everyday life*. London: Routledge.
- Argyle, M. (1996). *The social psychology of leisure*. Harmondsworth: Penguin.
- Barron, F., & Harrington, D. M. (1981). Creativity, intelligence, and personality. *Annual Review of Psychology*, 32, 439-476.
- Berlyne, D. E. (1971). *Aesthetics and psychobiology*. New York: Appleton-Century-Crofts.
- Bourdieu, P., Darbel, A., & Schhapper, D. (1991). *The love of art: European art museums and their public* (C. Beattie & N. Merriman, Trans.). Cambridge: Polity Press. (Original work published 1969)
- Burt, C. (1933). The psychology of art. In C. Burt (Ed.), *How the mind works* (pp. 267-310). London: Allen and Unwin.
- Cantagallo, A., & Della Sala, S. (1998). Preserved insight in an artist with extrapersonal spatial neglect. *Cortex*, 34, 163-189.

- Chamorro-Premuzic, T., & Furnham, A. (2005a). Art judgement: A measure related to both personality and intelligence? *Imagination, Cognition and Personality*, *24*, 3–24.
- Chamorro-Premuzic, T., & Furnham, A. (2005b). *Personality and intellectual competence*. Mahwah, NJ: Erlbaum.
- Coe, K. (2005). *The ancestress hypothesis: Visual art as adaptation*. New Brunswick, NJ: Rutgers University Press.
- Costa, P. T., & McCrae, R. R. (1992). *Revised NEO personality inventory (NEO PI-R) and NEO five-factor inventory (NEO-FFI): Professional manual*. Odessa, FL: Psychological Assessment Resources.
- Davis, J. A. (1985). *The logic of causal order*. London: Sage.
- Dollinger, S. J. (1993). Personality and music preference: Extraversion and excitement seeking or openness to experience? *Psychology of Music*, *21*, 73–77.
- Fechner, G. T. (1871). Zur experimentalen aesthetik. *Abhandlungen der königlichen-sächsischen Gesellschaft der Wissenschaften*, *9*, 555–635.
- Fechner, G. T. (1876). *Vorschule der aesthetik*. Leipzig: Breitkopf and Haertel.
- Feist, G. J. (1999). The influence of personality on artistic and scientific creativity. In R. J. Sternberg (Ed.), *Handbook of creativity* (pp. 273–296). Cambridge: Cambridge University Press.
- Feist, G. J., & Brady, T. R. (2004). Openness to experience, non-conformity, and the preference for abstract art. *Empirical Studies of the Arts*, *22*, 77–89.
- Fox, R. A., McManus, I. C., & Winder, B. C. (2001). The shortened study process questionnaire: An investigation of its structure and longitudinal stability using confirmatory factor analysis. *British Journal of Educational Psychology*, *71*, 511–530.
- Furnham, A., & Bunyan, M. (1988). Personality and art preferences. *European Journal of Personality*, *2*, 67–74.
- Furnham, A., & Chamorro-Premuzic, T. (2004). Personality, intelligence, and art. *Personality and Individual Differences*, *36*, 705–715.
- Furnham, A., & McManus, I. C. (2004). Student attitudes to university education. *Higher Education Review*, *36*, 29–38.
- Furnham, A., McManus, I. C., & Scott, D. (2003). Personality, empathy and attitudes to animal welfare. *Anthrozoös*, *16*, 135–146.
- Furnham, A., & Rao, S. (2002). Personality and the aesthetics of composition: A study of Mondrian and Hirst. *North American Journal of Psychology*, *4*, 233–242.
- Furnham, A., & Walker, J. (2001a). Personality and preference for abstract, pop art and representational paintings. *European Journal of Personality*, *15*, 57–72.
- Furnham, A., & Walker, J. (2001b). The influence of personality traits, previous experience of art, and demographic variables on artistic preference. *Personality and Individual Differences*, *31*, 997–1017.
- Furnham, A., & Walker, J. (2001c). Personality and judgments of abstract, pop art and representational paintings. *European Journal of Personality*, *15*, 57–72.
- Ghiselli, E. E., Campbell, J. P., & Zedeck, S. (1981). *Measurement theory for the behavioral sciences*. San Francisco, CA: W H Freeman.
- Griffin, M., & McDermott, M. R. (1998). Exploring a tripartite relationship between rebelliousness, openness to experience and creativity. *Social Behavior and Personality*, *26*, 347–356.
- Halligan, P. W., & Marshall, J. C. (1997). The art of visual neglect. *Lancet*, *350*, 139–140.
- Hocevar, D. (1981). Measurement of creativity: Review and critique. *Journal of Personality Assessment*, *45*, 450–464.
- Holland, J. L., & Nichols, R. (1964). Prediction of academic and extracurricular achievement in college. *Journal of Educational Psychology*, *55*, 55–65.
- Hudson, L. (1974). *Contrary imaginations*. Harmondsworth: Penguin.
- Jamison, K. R. (1995, February). Manic-depressive illness and creativity. *Scientific American*, *272*, 46–51.
- Kelloway, E. K. (1998). *Using LISREL for structural equation modelling: A researcher's guide*. Thousand Oaks, CA: Sage.

- Kenny, D. A. (1979). *Correlation and causality*. New York: Wiley.
- Kraaykamp, G., & van Eijck, K. (2005). Personality, media preferences, and cultural participation. *Personality and Individual Differences*, 38, 1675–1688.
- Kreitler, H., & Kreitler, S. (1972). *Psychology of the arts*. Durham, NC: Duke University Press.
- Loehlin, J. C. (1992a). *Genes and environment in personality development*. Newbury Park, CA: Sage.
- Loehlin, J. C. (1992b). *Latent variable models: An introduction to factor, path, and structural analysis* (2nd ed.). Hillsdale, NJ: Erlbaum.
- Ludwig, A. M. (1995). *The price of greatness: Resolving the creativity and madness controversy*. Cambridge, MA: Guilford Press.
- Mann, P. H., & Burgoyne, J. L. (1969). *Books and reading*. London: Andre Deutsch.
- Marsh, G. G., & Philwin, B. (1987). Unilateral neglect and constructional apraxia in a right-handed artist with a left posterior lesion. *Cortex*, 23, 149–155.
- Maruyama, G. M. (1998). *Basics of structural equation modelling*. Thousand Oaks, CA: Sage.
- Matthews, G., Deary, I. J., & Whiteman, M. C. (2003). *Personality traits* (2nd ed.). Cambridge: Cambridge University Press.
- McCrae, R. R., & Costa, P. T., Jr. (2003). *Personality in adulthood: A five-factor theory perspective* (2nd ed.). New York: Guilford Press.
- McManus, I. C. (1985). *Medical students: Origins, selection, attitudes and culture*. MD thesis, University of London.
- McManus, I. C. (2006). Measuring the culture of C P Snow's *Two Cultures*. *Empirical Studies of the Arts*, 24, 219–227.
- McManus, I. C., Keeling, A., & Paice, E. (2004, August 18). Stress, burnout and doctors' attitudes to work are determined by personality and learning style: A twelve year longitudinal study of UK medical graduates. *BMC Medicine*, 2, Article 29. Retrieved August 11, 2006, from <http://www.biomedcentral.com/1741-7015/2/29>
- McManus, I. C., Lissauer, T., & Williams, S. E. (2005). Detecting cheating in written medical examinations by statistical analysis of similarity of answers: Pilot study. *British Medical Journal*, 330, 1064–1066.
- McManus, I. C., Smithers, E., Partridge, P., Keeling, A., & Fleming, P. R. (2003). A levels and intelligence as predictors of medical careers in UK doctors: 20 year prospective study. *British Medical Journal*, 327, 139–142.
- Miller, G. (2000). *The mating mind: How sexual choice shaped the evolution of human nature*. London: William Heinemann.
- Moutafi, J., Furnham, A., & Paltiel, L. (2004). Why is conscientiousness negatively correlated with intelligence? *Personality and Individual Differences*, 37, 1013–1022.
- Pearl, J. (2000). *Causality: Models, reasoning, and inference*. Cambridge: Cambridge University Press.
- Persegani, C., Russo, P., Carucci, C., Nicolini, M., Papeschi, L. L., & Trimarchi, M. (2002). Television viewing and personality structure in children. *Personality and Individual Differences*, 32, 977–990.
- Powell, G. E. (1980). *Brain and personality*. Farnborough: Gower.
- Rawlings, D., Vidal, N., & Furnham, A. (2000). Personality and aesthetic preference in Spain and England: Two studies relating sensation seeking and openness to experience to liking for paintings and music. *European Journal of Personality*, 14, 553–576.
- Snow, C. P. (1964). *The two cultures and a second look*. Cambridge: Cambridge University Press.
- Spence, J. T., & Helmreich, R. L. (1978). *Masculinity and femininity: Their psychological dimensions, correlates and antecedents*. Austin, TX: University of Texas Press.
- Sternberg, R. J. (Ed.). (1999). *Handbook of creativity*. Cambridge: Cambridge University Press.
- Tolstoy, L. (1994). *What is art?* London: Duckworth 1896. (First published 1896)
- Valentine, C. W. (1913). *An introduction to the experimental psychology of beauty*. London: TC and EC Jack.
- Valentine, C. W. (1962). *The experimental psychology of beauty*. London: Methuen.

Wilson, G. (2002). *Psychology for performing artists*. London: Whurr.

Zuckerman, M. (1994). *Behavioral expressions and biosocial bases of sensation seeking*. Cambridge: Cambridge University Press.

Received 29 July 2005; revised version received 19 January 2006

## Appendix A

### The correlation matrix of the variables in the structural equation model

	se	age	male	hiclass	big5neur	big5ext
se	1.000					
age	0.033	1.000				
male	-0.115	0.048	1.000			
hiclass	-0.015	-0.080	0.022	1.000		
big5neur	-0.087	0.066	0.091	-0.072	1.000	
big5ext	0.006	-0.016	0.074	-0.031	0.116	1.000
big5open	0.040	-0.087	0.022	-0.153	0.209	0.168
big5agre	0.104	-0.050	-0.078	-0.114	0.090	0.011
big5cons	0.031	0.234	-0.012	-0.259	0.116	-0.044
mascfem	0.075	-0.011	0.079	-0.014	-0.030	0.172
edlevel	-0.024	0.047	-0.015	-0.068	-0.049	-0.073
artsci	0.039	-0.056	0.010	0.086	0.016	0.143
artedn	0.033	-0.004	-0.039	0.042	-0.041	0.021
musicedn	-0.253	-0.039	0.090	-0.010	0.213	0.009
sumpop	0.022	-0.010	0.103	0.037	-0.035	0.220
sumclass	0.007	-0.034	0.053	0.066	0.037	0.238
smart	-0.007	-0.103	0.081	0.069	-0.051	0.265
sumlit	-0.039	-0.103	0.062	0.077	0.066	0.038
sumperf	-0.080	0.003	0.035	0.011	0.082	-0.033
gofilm	-0.020	0.058	-0.093	0.044	-0.004	-0.170
tv	0.054	0.095	0.031	0.031	-0.153	-0.243
sumactiv	-0.016	0.059	0.012	0.045	0.098	0.125
attfac1	0.015	0.020	-0.030	0.064	-0.002	-0.106
attfac2	0.045	-0.024	0.009	0.033	0.056	0.221
attfac3	0.048	-0.045	0.086	0.002	0.068	0.106
attfac4	-0.083	-0.071	0.105	0.079	0.059	0.217
attfac5	-0.024	-0.054	0.019	-0.009	0.181	0.360

	big5open	big5agre	big5cons	mascfem	edlevel	artsci
big5open	1.000					
big5agre	0.195	1.000				
big5cons	-0.149	0.132	1.000			
mascfem	0.077	-0.003	-0.067	1.000		
edlevel	-0.025	0.043	0.058	0.008	1.000	
artsci	0.018	-0.026	-0.054	0.091	-0.313	1.000
artedn	-0.059	-0.090	-0.072	0.031	-0.064	0.246
musicedn	-0.005	-0.093	-0.029	0.005	-0.099	0.023
sumpop	-0.076	-0.122	-0.040	0.126	-0.122	0.090
sumclass	-0.053	-0.093	-0.043	0.111	-0.314	0.457

**Appendix A.** (Continued)

	se	age	male	hiclass	big5neur	big5ext
sumart	-0.026	-0.084	-0.087	0.091	-0.184	0.086
sumlit	-0.116	-0.043	-0.003	0.011	-0.162	0.113
sumperf	-0.062	0.000	0.077	-0.037	-0.054	0.110
gofilm	-0.044	-0.022	0.018	-0.129	-0.024	0.013
tv	-0.153	-0.006	0.094	-0.102	0.253	-0.304
sumactiv	0.013	-0.010	-0.077	0.057	0.056	0.009
atffac1	-0.156	0.008	-0.026	-0.059	-0.073	0.031
atffac2	0.006	-0.018	-0.041	0.094	-0.092	0.059
atffac3	0.111	0.025	-0.071	0.065	-0.038	-0.005
atffac4	-0.093	-0.136	-0.056	0.090	-0.276	0.255
atffac5	0.193	-0.005	-0.118	0.164	-0.138	0.201

	artedn	musicedn	sumpop	sumclass	sumart	sumlit
artedn	1.000					
musicedn	0.011	1.000				
sumpop	0.322	0.108	1.000			
sumclass	0.166	0.198	0.391	1.000		
sumart	0.109	0.088	0.352	0.368	1.000	
sumlit	0.176	0.219	0.418	0.393	0.326	1.000
sumperf	0.028	0.148	0.011	0.202	0.136	0.285
gofilm	-0.077	0.079	-0.224	-0.066	-0.078	-0.071
tv	-0.132	-0.189	-0.184	-0.375	-0.162	-0.223
sumactiv	0.070	0.046	0.072	0.057	-0.008	-0.039
atffac1	0.048	-0.015	0.020	0.020	0.033	0.124
atffac2	0.047	0.053	0.075	0.132	0.078	0.006
atffac3	-0.011	0.001	0.067	0.046	0.001	0.008
atffac4	0.232	0.471	0.661	0.738	0.678	0.661
atffac5	0.114	0.166	0.185	0.310	0.110	0.071

	sumperf	gofilm	tv	sumactiv	atffac1	atffac2
sumperf	1.000					
gofilm	0.065	1.000				
tv	-0.076	0.043	1.000			
sumactiv	-0.073	-0.096	0.000	1.000		
atffac1	0.099	0.031	0.000	0.000	1.000	
atffac2	-0.032	-0.078	0.000	0.000	0.000	1.000
atffac3	0.044	-0.054	0.000	0.000	0.000	0.000
atffac4	0.321	0.023	-0.338	0.020	0.062	0.090
atffac5	-0.034	-0.131	-0.627	0.534	-0.403	0.343

	atffac3	atffac4	atffac5
atffac3	1.000		
atffac4	0.030	1.000	
atffac5	0.204	0.233	1.000

## Appendix B

### **Checking for data fabrication and multiple participation**

A referee for the paper commented that:

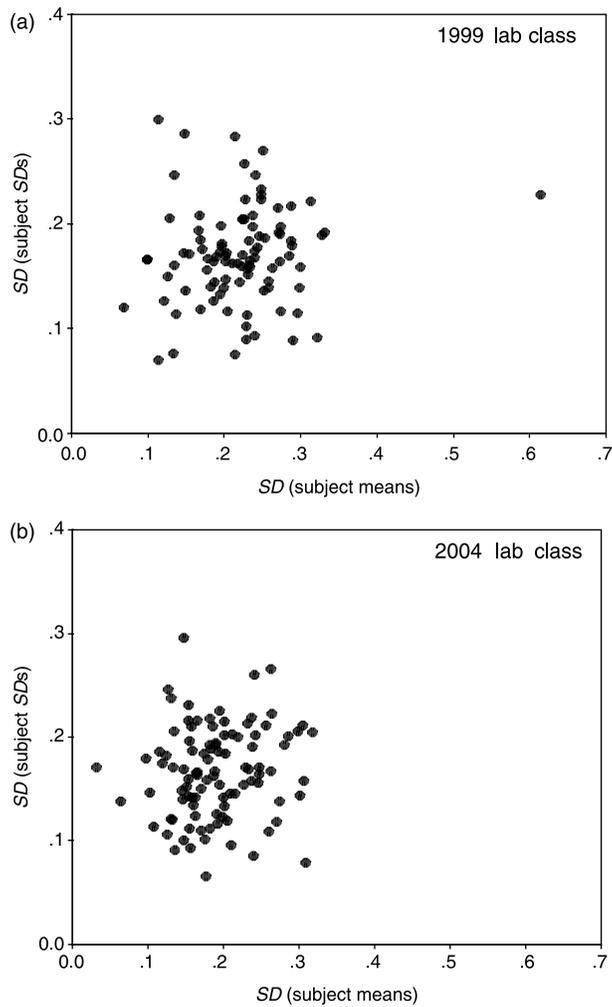
My major concern with the validity of the results is that, given the method of recruiting participants, were there any controls for data fabrication or multiple participation? (A) A few students could have fabricated data in order to obtain 12 participants, particularly any who procrastinated until the deadline. Alternatively, it is possible that some individuals participated twice, i.e. participants who were recruited by more than one student in the lab class, either neglecting to tell the second person that they had already done so or agreeing to do so because they valued their friendship more than scientific integrity. From the literature on academic dishonesty by university students (at least in the United States), I would imagine that this could affect the data collected by perhaps 1–5% of the students.

These are two important questions, and we will consider them separately.

(i) *Data fabrication*. Although the fabrication of data is relatively straightforward, in the sense that a student could easily put ticks in boxes on behalf of non-existent respondents, it is far more difficult to put those ticks in boxes in a similar way to genuine respondents, particularly when a student has to submit 12 separate and different questionnaires.<sup>1</sup> Making up data is particularly difficult on novel attitude questions, where a student will have little idea of the typical answers given by respondents and, in particular, is unlikely to be able to guess the variability of respondents in the population. It is therefore likely that any fabrication will leave a statistical signature which is different from that of genuine data. When the class was first carried out, in 1999, we worried about the possibility of fabrication and therefore developed a straightforward method for looking for fabricated data.

Each questionnaire contains a number of attitude questions, of which there were 32 in the 1999 class. For each questionnaire respondent we calculated  $mean_R$  and  $SD_R$ , which were the mean and  $SD$  of the 32 responses made by that respondent, each attitude question being scored from 1 to 4, where 1 was definitely disagree and 4 was definitely agree. Each student submitted questionnaires from 12 respondents, and we then calculated  $SD(mean_R)$  and  $SD(SD_R)$  the standard deviation of the  $mean_R$  and the standard deviation of the  $SD_R$  for the 12 questionnaires submitted by each student, giving measures of the variability of the means and the standard deviations of the data submitted by each student. Our assumption is that such values are (a) difficult for students to know in advance for novel questions, and therefore (b) difficult to fake in any easy way. Figure 5a plots the values of  $SD(mean_R)$  and  $SD(SD_R)$  for each of the students taking part in the lab class in the 1999 class. It can be seen that there is a single extreme outlier, who is 5.68 standard deviations from the mean of  $SD(mean_R)$ . The raw probability of such an outlier is  $6.5 \times 10^{-9}$ , and after Bonferroni correction for the  $N$  of 97, gives a probability of  $6.3 \times 10^{-8}$ , which is highly significant. An interview with the student revealed that indeed these data were synthetic, thereby validating the statistical method. In future years of the laboratory class, the students were informed about the 1999 analysis, and warned that a similar statistical analysis would be carried out. Figure 5b shows the analysis for the subjects in the 2004 laboratory class described in the present paper; there are no statistical outliers, and hence we can be moderately confident that the data are not fabricated.

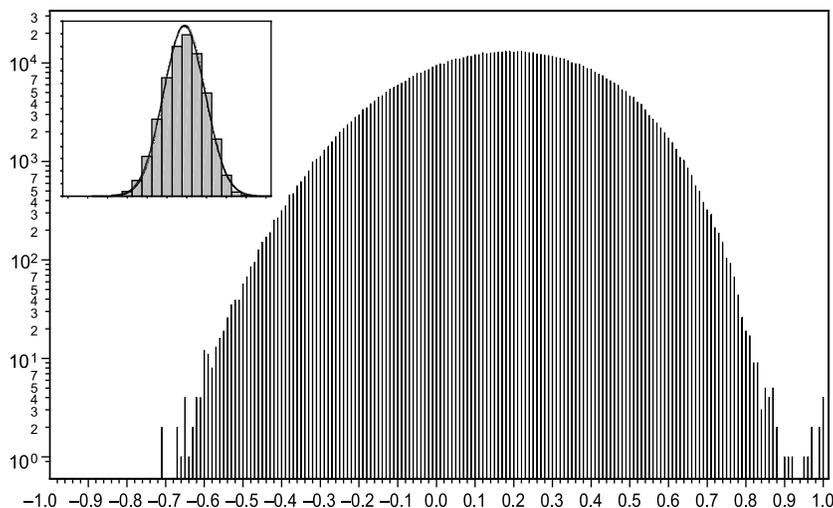
<sup>1</sup> We should emphasize that, for practical reasons, students typed their own data into an SPSS file, which was submitted to the experimenters, and the original questionnaires themselves were retained by the students. We cannot therefore carry out validity checking in terms of handwriting, etc.



**Figure 5.** Scattergram of the variability of the mean score of individual questionnaires submitted by each student against the variability of the standard deviations of the questionnaires submitted by each student. (a) Data for the 1999 lab class and (b) data for the 2004 lab class on which the present study is based. See text for further details.

(ii) *Multiple participation.* Two approaches can be used to address this problem, one theoretical and the other data-intensive. (a) *Theoretical analysis.* If it were the case that a small percentage of subjects had inadvertently had their data included twice, for whatever reason, then the probable effect upon estimates of correlations would inevitably be minimal, assuming that the duplicates are randomly sampled from the population, and are not extreme outliers. We simulated this by looking at the correlations between the five Big Five personality measures, both in the full data set and in a data set in which 100 cases were randomly removed and another 100 randomly chosen cases were duplicated. Of the 10 correlations between the Big Five measures, the seven that were significant at the .05 level remained so in the modified dataset, and the three non-significant correlations remained non-significant. The median absolute change in a correlation was .0118, and the largest change was from a correlation

of .1170 ( $p < .001$ ) to .0936 ( $p = .0013$ ). Since it is unlikely that anything like as many as 100 cases were inadvertently duplicated, then the impact on the correlational structure can be assumed to be fairly small. (b) *Computer-intensive analysis*. This method is conceptually similar to that used by one of us in a very different context to identify individuals cheating in a high-stakes multiple choice examination (McManus, Lissauer, & Williams, 2005). Consider the  $1,199 \times 1,199$  matrix containing the correlations between all possible pairs of subjects, based on their 33 attitude questions. The lower triangle of the matrix contains 718,201 correlations indicating the similarity of each subject to each other subject. If a respondent has inadvertently been included twice then it can be assumed that their attitudes on the two occasions will be extremely similar. Figure 6 shows the distribution of the 718,201 correlations, which have a mean of .1757 and a standard deviation of .2098. The distribution is close to normal, as is seen in the small graph at top left, but of course will not be exactly normal since correlations cannot exceed unity. Outliers are more easily seen when the ordinate is plotted on a logarithmic scale, as in the main graph. The 99th percentile is .621, and the 99.9th percentile is 0.727. Only 13 pairs were correlated at 0.9 or above, and the 23 respondents contributing to these were all examined (some respondents contributed to multiple pairs). Six of the pairs were related to respondents entered by a single student. However, closer examination found that these all had different combinations of age and sex, their degree subjects were mostly different and their Big Five scores were different. In one of the pairs the data were different until the attitude questions started, and then the remainder of the data in the questionnaire were identical, a pattern which we presume was an error of data entry, perhaps due to omitting to turn a page while entering data. Overall, four pairs had correlations of exactly one in their answers to the attitude questions. However, apart from the one described above who seemed like a data entry problem, all of the other pairs differed in demographic and personality measures. Taken overall there was no evidence to suggest that respondents had inadvertently taken part in the survey on two occasions.



**Figure 6.** Histograms of the correlations between responses of each of the possible pairs of respondents. The inset graph plots the ordinate on a conventional, linear scale, whereas the main graph plots the ordinate on a logarithmic scale, so that small values are more visible. See text for further details.