

**THE SEARCH FOR OBJECTIVE MEASURES
OF AESTHETIC JUDGMENT:
THE CASE OF MEMORY TRACES**

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ABSTRACT

Verbal responses have frequently been used to measure aesthetic experience. They usually take the form of semantic judgments regarding specific aspects or dimensions of certain stimuli. The use of this kind of technique has produced a great amount of knowledge, but its combination with objective procedures can increase the validity and reliability of measurement. In this study, we set out to assess whether memory traces can serve as an objective control element for subjective aesthetic judgments. We analyzed the relation between aesthetic judgment and recognition of *High Art* and *Popular Art* visual stimuli by participants with and without formal art education. Results show that participants tended to give higher pleasantness and beauty ratings to those stimuli that have left a strong memory trace. Lower scores were awarded to stimuli they did not recognize well. However, originality and interest ratings did not follow the same trend. This disparity is discussed in relation to the dimensionality of aesthetic experience and the influence of formal art education on subjective measures of aesthetic experience.

Today's empirical study of art and aesthetics owes much to the work of Daniel Berlyne. One of his main goals was to establish psychology of art as a scientific discipline, and he concerned himself with the development of solid experimental procedures. He believed that "Whether a branch of study can be called scientific

does not depend on whether it has yet answered its questions. It depends on what kind of questions it is asking and what methods it adopts in seeking answers to them” (Berlyne, 1971, p. 2). Among the features that set scientific inquiry apart from other forms of knowledge-seeking, such as attention to observable phenomena or emphasis on prediction, measurement was particularly important for Berlyne: “Measurement must play a central role in the psychology of art” (p. 5). However, just as in other areas of psychology, researchers need to find a balance between the study of complex psychological phenomena in a meaningful way and the need to do so by means of simple and clear measures. This balance is particularly difficult to reach in the field of psychology of art, given the risk of oversimplifying psychological processes through quantification or analytic procedures.

Traditionally, researchers have used two kinds of methods to study aesthetic experience. *Subjective* methods require participants to give verbal responses, usually in the form of semantic judgments, with regards to a certain aspect or dimension of an aesthetic object. *Objective* methods, on the other hand, involve the observation and recording of behavioral or psychophysiological variables, such as body movements or heart rate (Dumaurier, González, & Molnar, 1979). Subjective measures have been extensively used in psychology of art research, mainly to record semantic judgments reflecting participants’ aesthetic preferences. Despite the fact that this approach has yielded a wealth of knowledge, it is also true that the use of good objective methods, given their reliability, constitutes a valuable addition to subjective measurements.

The identification of objective measures that can be used to complement or contrast subjective aesthetic judgments is the general aim of a broad research program which serves as a frame for the study reported here. Within this line of research, some previous empirical studies have explored the presence of schemes during the recognition of aesthetic stimuli (Cela-Conde, Marty, Munar, Nadal, & Burges, 2002; Marty, 2002), the factorial dimension of aesthetic experience (Marty et al., 2003) and the brain correlates of aesthetic judgments (Cela-Conde et al., 2004). In order to broaden this line of research, here we follow up on the possibility of using the strength of memory traces as an objective measure of aesthetic judgment (Marty, Munar, & Nadal, 2005). Specifically, we assessed whether there is a relationship between the strength of the memory traces left by complex and varied visual stimuli and the subjective aesthetic judgment of these same stimuli by participants with and without art education.

We grounded our research on scheme-based theories of memory. Schemes are regarded as high-level cognitive units related with comprehension, memory, action and other cognitive functions. From this point of view, memory is a reconstructive process guided by previously constructed schemes or generic representations and, specifically, recognition is considered as the activation of a previously generated scheme. In the present study, schemes are formed in the learning phase, during which, some target stimuli will probably favor the creation

of schemes, while others will not. Those stimuli that have failed to fix a scheme will not be identified as previously seen in the later recognition task. Alternatively, given that schemes do not codify detailed information, resembling sketchy representations of previous experiences, it is to be expected that novel stimuli resembling those presented in the learning phase, distracters, might be recognized by mistake. This transfer effect will increase with the strength of the memory trace left by the stimuli presented during the learning phase.

Thus, we defined the strength of the memory trace produced by each target stimulus as the sum of hits (correct identification during the recognition task of the target stimulus presented in the learning phase) and false alarms (taking a distracter as a target stimulus) registered in the recognition task. We considered that a stimulus had left a *strong memory trace* when the participant marked both target and distracter as previously seen. We considered this to be the case of maximum familiarity with the target stimuli. We believe that the marking of both the target stimulus and the specific distracter as previously seen is due to the fact that the scheme, or memory trace, produced by the target stimulus is so strong—it has a low activation threshold—that it is easily activated by the target and distracter stimuli. Alternatively, when the set target-distracter was marked as previously unseen, we concluded that the target stimulus failed in fixing a scheme, and named this situation *null trace*. In this case, we considered the participant to be unfamiliar with the stimuli. Intermediate cases, with only one element of the pair marked as previously seen and named *weak trace*, are more difficult to interpret and were not taken into account in the data analyses.

The choice of material and participants also deserves a brief remark. First, much research in psychology of art has been carried out with simple materials, such as geometric figures or artificially generated displays. It is undeniable that these materials favor experimental control over different variables related with the stimuli, but it is not entirely obvious that they elicit the same cognitive processes as artistic materials. For this reason there has recently been a considerable growth in the number of studies including objects pertaining to the world of art, such as sculptures, music, or paintings created by artists with the intention of producing a work of art. The experiment reported in this article is clearly in line with the latter trend. Second, despite the fact that much of the effort put into the research of aesthetic experience has centered on features of the stimuli, such as complexity, prototypicality, familiarity, and the degree of abstraction, it is evident that certain features of the perceiver are also critical in shaping aesthetic experiences. Specifically, cognitive styles and personality traits, such as openness or tolerance, have been proven to have major roles (Feist & Brady, 2004). Additionally, several studies have already demonstrated that art education influences the aesthetic judgment of different visual patterns and diverse artworks (Cela-Conde et al., 2002; Furnham & Walker, 2001; Hare, 1974; Hekkert & Van Wieringen, 1996). Thus, there were reasons to assume

that artistic education, included as a variable in the present study, might also influence how memory traces are related with aesthetic judgments.

The following statement summarizes the main hypothesis we set out to test: The stimuli that leave stronger memory traces are those that receive greater scores in the aesthetic judgment scales, regardless of stimulus category. We expected this prediction to be true for participants without art education. Conversely, we believed formal artistic education might modify this tendency, and expected a different trend in the artistically trained group of participants.

METHOD

Participants

One hundred students at the University of the Balearic Islands in the last term of their degree volunteered to participate in this study. Half of the participants were psychology students (38 female and 12 male) with no art education, while the other half were art history students (34 female, 16 male) and constituted the group with art education.

Materials

We selected and prepared 104 *High Art* and *Popular Art* pictures (Winston & Cupchik, 1992) to present to participants in three experimental sessions. All the pictures had the color removed and were adjusted to the same size (14 by 10 cm.). The set of High Art pictures included catalogued works by famous painters from which the signature had been removed. Following Eysenck's (1940) suggestion regarding the need to eliminate distortion factors, such as the celebrity of a work of art, well-known artworks were not included. Half of the High Art pictures were Representational, while the other half were Abstract, in accordance with the usual criterion about the explicit style of pictorial works. The pictures in the Popular Art set were obtained from the MasterClips Premium Image Collection, which includes icons and illustrations used for industrial design. Most of these images are not signed, and are used in advertising, book illustrations, and so on. Just as in the High Art category, half of the pictures were Representational and the other half were Abstract. Eight of the pictures, four representational and four abstract, were included to eliminate primacy and recency effects. The remaining 96 pictures were grouped into four categories: 24 Representational Artistic stimuli (RA), 24 Abstract Artistic stimuli (AA), 24 Representational Decorative stimuli (RD), and 24 Abstract Decorative stimuli (AD).

According to their role in the recognition task, half of the stimuli pertaining to each of the four categories of stimuli were considered targets, while the remaining stimuli were considered distracters. This arrangement was designed such that each target stimulus had a corresponding specific distracter, defined as

follows: The distracter for each Representational-Artistic target stimulus was a picture of similar content, same painter and period. The distracter for each Abstract-Artistic target stimulus was a picture of same painter and period. The distracter for each Representational-Decorative target stimulus was an image pertaining to the same series in the MasterClips catalogue and of similar content. The distracter for each Abstract-Decorative target stimulus was an image pertaining to the same series in the MasterClips catalogue and of similar style.

Design and Procedure

Participants carried out a memory task divided in two sessions separated by a retention interval of 24 hours. In the first session, the learning phase, participants were asked to attentively look at the 48 pictures we have described as targets. As previously stated, in order to control for primacy and recency effects, we included four additional pictures at the beginning of the presentation and four at the end, which were not presented in the following phases. The time of exposure of each stimulus was 4 seconds. Between each image we included a 1-second masking screen. Both the exposure times and the retention interval were adjusted according to the results of several pilot studies. These had revealed, on one hand, that a shorter presentation time, while not significantly altering familiarity with the stimuli, decreases participants' ability to discriminate targets from distracters; on the other hand, shorter retention intervals produced very strong memories, leading to almost no mistakes.

In the second phase of the memory task we showed the participants the same 48 target pictures as well as the 48 specific distracters (one for each target) in a random order and including the masking screens. The participants were asked to state whether they had seen each of the stimuli in the previous session. In this session the stimuli were presented for 3 seconds, while the masking screen was presented for 2 seconds.

In the third and last session, we obtained participants' aesthetic judgments of the stimuli. Several procedures have been suggested to record preference ratings for artworks. We decided to use the semantic differential technique, given its extensive application in the field of psychology of art. The next question concerned the choice of semantic scales. Eysenck (1940) argued for the existence of a general factor of aesthetic experience, and suggested that the beautiful-ugly dimension represents better than others the phenomenon of aesthetic experience. Additionally, this dimension appears in an important number of studies of aesthetic appreciation based on the semantic differential technique, and was put forward by Osgood, Suci, and Tannebaum (1957) as an adequate judgment when rating artistic pictures. However, our objective was to retrieve a sufficiently broad range of aesthetic judgments, so we were keen to incorporate several other dimensions. The study by Hernández Belver (1989) included, besides the beautiful-ugly pair, the dimensions of interesting-uninteresting and

pleasant-unpleasant. In a further addition to the aforementioned pairs, we also included in our study the original-ordinary pair, used by Choynowski (1967). Thus, in this final experimental session subjects were presented the same 96 stimuli as in the previous session and asked to perform, for each of them, a semantic judgment task. They had to rate, on a 1 to 10 scale, the following dimensions: *pleasant*, *beautiful*, *interesting*, and *original*. The order of the dimensions was counterbalanced. The 96 stimuli were randomly presented for 15 seconds each, with a masking screen presented for 1 second.

RESULTS

In order to test our main hypothesis, that stimuli that left a strong memory trace were awarded higher aesthetic scores than those that left a null memory trace, we subjected our two dependent variables (recognition and aesthetic judgment of the stimuli) to some transformations. First, for each participant we created three stimulus categories according to the strength of the memory trace they left. If during the recognition task both the target and its specific distracter were identified as previously seen in the learning phase, the target stimulus was considered to have left a strong memory trace. If only one stimulus of the target-distracter stimulus pair was identified, we considered the target stimulus to have left a weak trace. (As mentioned, these data were not included in the analyses described below.) Conversely, if neither stimulus was marked as previously seen, we considered that the target had left a null trace. Thereafter we calculated, within each stimulus category, the average scores given in the aesthetic judgment task to strong-trace stimuli and null-trace stimuli by each participant in each of the four rating dimensions. Finally, we compared the average aesthetic ratings for strong-trace and null-trace stimuli for each group of participants, classified by rating dimension and stimulus-type using paired-samples Student's *t* tests. Results of these analyses are presented in Tables 1 and 2 for participants without and with art education, respectively.

Regarding the group of participants without artistic education, as illustrated in Figure 1, differences in preference ratings favouring strong-trace stimuli appear in almost all conditions. Most of these instances reach statistical significance levels. Only in one case, that of abstract decorative stimuli in the original dimension, does the difference favor null-trace stimuli, although this difference is not significant (see Table 1). Thus, for participants without art education, the hypothesis is supported by the overall set of data.

Regarding the findings for participants with art education (see Figure 2), their results are quite similar to the other group of participants for the pleasant and beautiful dimensions (compare Figures 1 and 2); there are significant or near-significant differences (as is the case with AA and RD in the beautiful dimension) in aesthetic judgment favoring strong-trace stimuli. For these two dimensions, results seem to support the hypothesis for the group of participants with art

Table 1. Comparison of the Scores Awarded to Strong-Trace and Null-Trace Stimuli for the Participants Without Art Education in Each Dimension and for Each Category

Dimensions	Category	Difference strong-null trace	<i>t</i>	<i>df</i>	<i>p</i>
Pleasant	RA	.654	3.03	45	.004
	AA	.144	.66	36	.514
	RD	.580	2.40	43	.021
	AD	.495	3.08	37	.004
Beautiful	RA	.980	3.55	44	.001
	AA	.796	2.49	36	.017
	RD	.881	2.77	42	.008
	AD	.352	1.34	36	.187
Interesting	RA	.689	2.42	44	.020
	AA	1.355	3.94	36	.001
	RD	.668	1.99	42	.053
	AD	.313	.96	36	.345
Original	RA	.154	.48	44	.636
	AA	.677	2.29	36	.028
	RD	.715	2.69	42	.010
	AD	-.622	-1.80	36	.081

Note: Abbreviations for stimuli categories: RA = representational artistic, AA = abstract artistic, RD = representational decorative, AD = abstract decorative.

education. On the other hand, the hypothesis is not supported for the interesting and original dimensions. In these cases, participants with art education tended to rate strong-trace and null-trace stimuli in a similar way (see Table 2).

The main differences in the rating trends between both groups of participants appear in the interesting dimension. When participants without art education rated the interest of artistic stimuli they followed the general trend, which is to give higher scores to strong-trace stimuli than to null-trace stimuli. However, participants with art education gave similar scores to representational and abstract artistic stimuli that have left a strong trace and those that did not.

DISCUSSION

We have shown that stimuli that leave stronger memory traces tend to be valued as pleasant and beautiful. Although our experimental design does not

Table 2. Comparison of the Scores Awarded to Strong-Trace and Null-Trace Stimuli for the Participants With Art Education in Each Dimension and for Each Category

Dimensions	Category	Difference strong-null trace	<i>t</i>	<i>df</i>	<i>p</i>
Pleasant	RA	.950	3.09	40	.004
	AA	.352	2.02	43	.049
	RD	.827	3.16	38	.003
	AD	.807	3.06	39	.004
Beautiful	RA	.950	2.74	40	.009
	AA	.589	1.89	42	.066
	RD	.666	1.77	38	.084
	AD	.364	.98	37	.333
Interesting	RA	.451	1.43	40	.159
	AA	.436	1.46	42	.152
	RD	.691	1.76	38	.087
	AD	.211	.61	37	.544
Original	RA	-.047	-.16	40	.872
	AA	.443	1.46	42	.151
	RD	.163	.04	38	.652
	AD	.204	.53	37	.597

Note: Abbreviations for stimuli categories: RA = representational artistic, AA = abstract artistic, RD = representational decorative, AD = abstract decorative.

allow us to establish a causal relationship between both measures of aesthetic experience, our results reveal that they are associated. This fact can be used as a base to adequately complement subjective measures of aesthetic experience, such as the semantic judgments of beauty and pleasantness, with an objective measure, in this case, the strength of the memory trace. However, when participants rated the originality and interest of aesthetic stimuli, the general tendency does not seem to have held for either group of participants. This difference might be related to the dimensional nature of the aesthetic experience. While it has been shown that ratings of pleasingness and beauty are associated with the hedonic value of the experience (Berlyne, 1974), ratings of originality seem to be associated with a different dimension, namely, one that has to do with the assessment of aspects such as the degree of realism, naturalism, or conventionality (Axelsson, 2004). Thus, the formation and activation of memory schemes may be mainly related to the hedonic tone dimension of aesthetic experience.

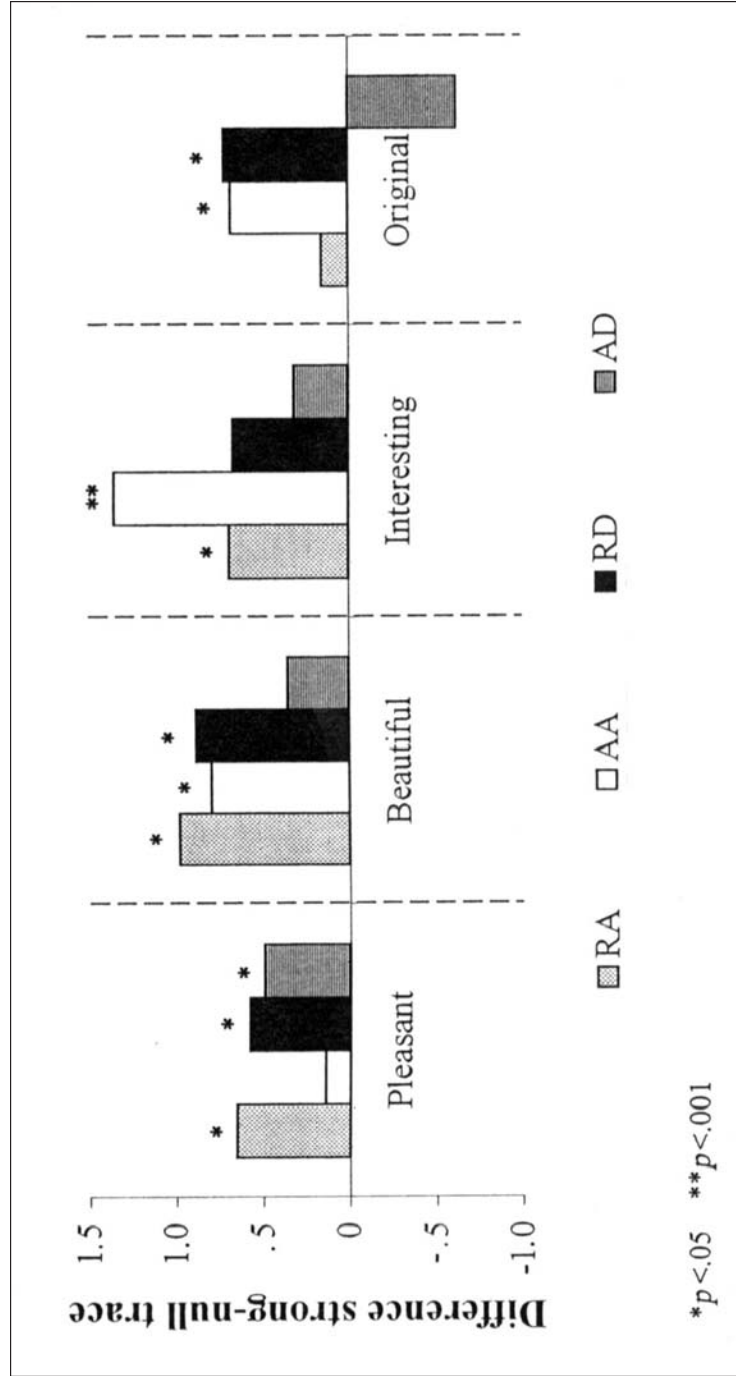


Figure 1. Differences between the mean scores awarded to strong-trace and null-trace stimuli for the group of participants without art education. Abbreviations for stimuli categories: RA = representational artistic, AA = abstract artistic, RD = representational decorative, AD = abstract decorative.

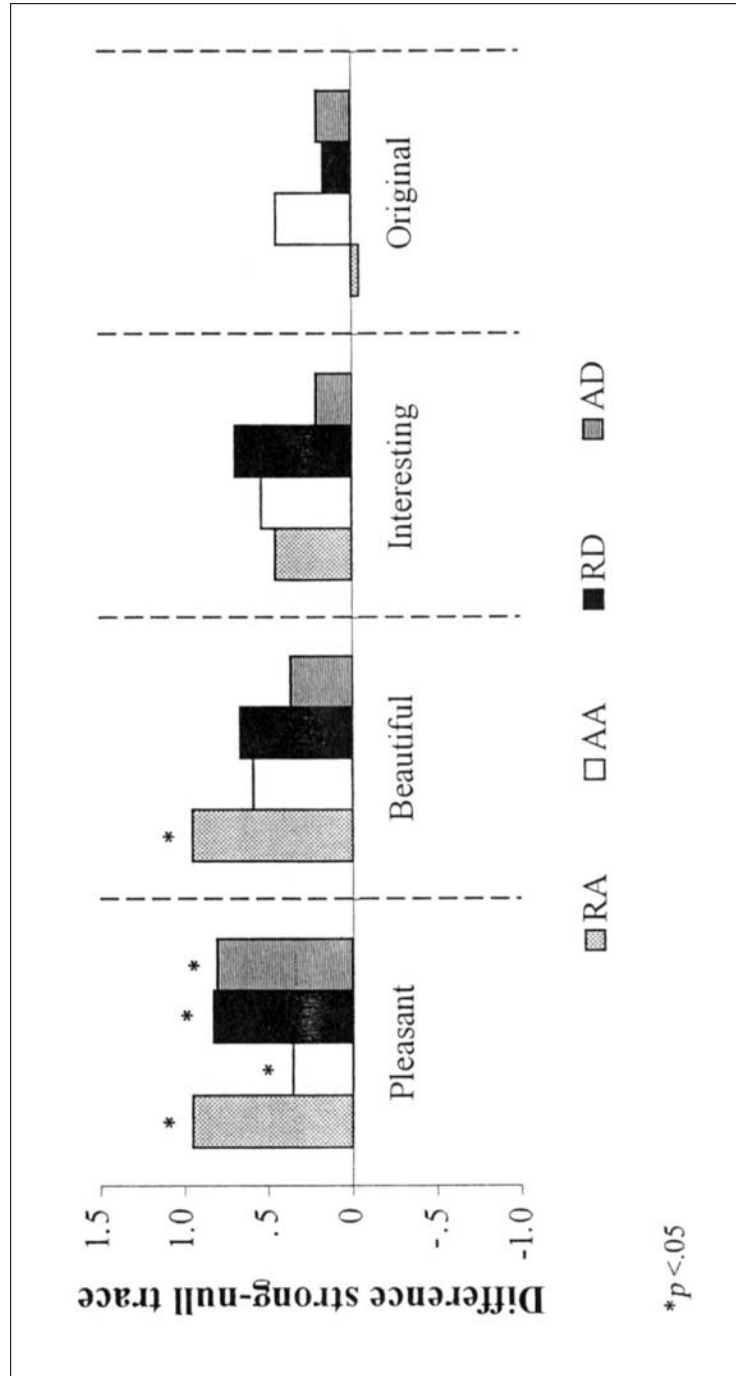


Figure 2. Differences between the mean scores awarded to strong-trace and null-trace stimuli for the group of participants with art education. Abbreviations for stimuli categories: RA = representational artistic, AA = abstract artistic, RD = representational decorative, AD = abstract decorative.

The relationship between aesthetic judgment and memory trace was found to be similar in both groups of participants for the original dimension, that is to say, there is no apparent effect. However, an intriguing issue is raised by the results in the interesting dimension for which the relationship is different in both groups. When rating the interest of artistic stimuli, subjects without art education followed the general rule which was observed for the beautiful and pleasant dimensions—namely, showing very clear differences between the scores given to strong-trace stimuli and those given to null-trace stimuli. Conversely, participants with art education show no such differences. Thus, when rating stimuli in the interesting dimension, participants with art education tended to give similar scores to strong and null memory traces. This difference between the two participant groups appears with Representational and Abstract Artistic stimuli. An experiment carried out by Hartley and Schwartz (1966) may explain this observation. They found that, when performing aesthetic judgments of the form “I like it very much” or “I dislike it very much,” subjects responded according to how they thought someone with their own personality should respond. This explanation is useful to understand why participants with art education gave relatively high interest scores to stimuli that have not impressed them enough as to leave a strong memory trace. They were using a strategy in contrast to the general tendency of awarding higher scores to familiar stimuli, which consisted of rating the interest of stimuli according to the idea they had of what should seem interesting to art students such as themselves.

The fact that the recognition and judgment measures rendered different results underlies the advantages of counting with the memory trace as an objective indicator of aesthetic experience. In the present study, the differences between the objective and subjective measures allowed us to isolate the specific effect that the variable art education has on judgments of the interest of aesthetic objects.

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