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A model of aesthetic appreciation and aesthetic judgments

Helmut Leder[1,2]*, Benno Belke[1], Andries Oeberst[1] and Dorothee Augustin[1]

[1]Freie Universität Berlin, Institute of Psychology, Germany
[2]Universität Wien, Austria

Although aesthetic experiences are frequent in modern life, there is as of yet no scientifically comprehensive theory that explains what psychologically constitutes such experiences. These experiences are particularly interesting because of their hedonic properties and the possibility to provide self-rewarding cognitive operations. We shall explain why modern art's large number of individualized styles, innovativeness and conceptuality offer positive aesthetic experiences. Moreover, the challenge of art is mainly driven by a need for understanding. Cognitive challenges of both abstract art and other conceptual, complex and multidimensional stimuli require an extension of previous approaches to empirical aesthetics. We present an information-processing stage model of aesthetic processing. According to the model, aesthetic experiences involve five stages: perception, explicit classification, implicit classification, cognitive mastering and evaluation. The model differentiates between aesthetic emotion and aesthetic judgments as two types of output.

Psychology of aesthetic appreciation

Our aim in this article is to explain why people are attracted by art. We give an answer from a psychological perspective with special interest paid to psychologically relevant features of art, especially modern art. We discuss how cognitive processing of art produces affective, often positive and self-rewarding aesthetic experiences. We propose a model that represents different processing stages as well as important variables that are involved in aesthetic experiences. We aim to understand the art-specific cognitive experiences that give art such a prominent position in human culture and thus go beyond perceiving art solely as an interesting perceptual stimulus. Moreover, we show that the often-controversial modern or contemporary art is particularly interesting from such a psychological perspective. Although we mainly focus on visual arts, the

* *Correspondence should be addressed to Helmut Leder, Freie Universität Berlin, Institute of Psychology, Habelschwerdter Allee 45, 14195 Berlin, Germany (e-mail: leder@experimental-psychology.de).*

mechanisms we describe should also be transferable to aesthetic experiences with other forms of art and aesthetic experiences. There is no doubt that art is the prototypical domain for questions of aesthetic research but other objects may also be treated as aesthetically relevant. There is, for example, considerable progress in understanding which faces are found aesthetically pleasing (Etcoff, 1999) or what design in everyday objects such as cars is aesthetically appreciated (Hekkert, Snelders, & van Wieringen, 2003; Leder & Carbon, in press).

Every year thousands attend blockbuster art exhibitions. The 'Matisse–Picasso' exhibition in the Tate Modern in London sold just under half a million tickets, and the 2002 *Documenta* in Kassel, a controversial exhibition of contemporary art, even had more than 650,000 visitors. People are exposed to art in magazines and TV programmes. Art even has the power to transform a town and put it back on the tourist track. Witness, for example, the huge success of the Guggenheim in Bilbao. However, art is not the only way that we are exposed to aesthetic experiences. Fashion and design, too, give credence to the claim of art historians that we live in an increasing '*aesthetisation* of the world'.

On the other hand, there seems to be a crisis in modern art and its reception. Due to the introduction of video and recently of web-art, the borders between what was considered an artwork once and what is called art today are continuously changing. There is a marked tendency to abandon the old concepts of beauty as the sole criterion of good art and to replace it with a more general concept of pleasure and more cognitive concepts of interest and stimulation. As a result, art appreciation more than ever before requires explicit information processing, which is reflected in Gehlen's (1960) contemptuous thesis of a 'need for commentary'. Psychologically, all these developments require new explanations of why people are searching for challenge in art: These explanations should be based on understanding the psychological mechanisms which make processing of art such a fascinating and reinforcing experience.

In psychology, aesthetics have a long tradition as an empirical discipline. The question of what people find aesthetic plagued the forerunners of experimental psychology such as Fechner (1871) and Wundt (1874). Since then the investigation of aesthetic experience has mainly been a discipline of visual perception, with a clear focus on the visual properties of artworks or art-like stimuli. Although never a broad area, there is now considerable knowledge about what visual properties bear the potential to be aesthetically experienced or at least affect aesthetic preferences.

An examination of modern art reveals that many of those properties investigated by early psychologists are not readily seen in examples of 20th century artworks. For nearly a century, visual properties have been complemented by conceptual ideas and, from Dadaism on, a common visual appearance is no longer a marker for a commonly agreed style in schools or movements of art. Rather, it turned out that over the last century, art is deemed distinctive through some features that need to be addressed from a psychological point of view in order to understand the aesthetic experience comprehensively. In the next section we discuss these features of art. Following this analysis, we present an information-processing model that explains the occurrence of aesthetic pleasure and the formation of aesthetic judgments.

Modern art from a psychological view

Artists have been more and more liberated from academic constraints ever since the beginning of the modern period of art in the 19th century. In the 20th century, important

artists developed individually distinctive approaches to depiction. In some cases the creation of an individual style was accompanied by theoretically based approaches to art (Shiff, 1986, for a discussion of Cézanne's approach). The last century witnessed a rapid development of numerous artistic approaches sometimes organized into movements where large numbers of artists were associated. Cubism, expressionism or surrealism are but just a few of such movements. However, from the middle of the last century on even this conceptual labeling of art schools has mostly been abandoned in favour of even more individualized productions of art that are now mainly associated with single artists.[1]

This experimental character of 'inventing' new styles within a relatively short time leads to a dominance of style over content and even to the disappearance of content in abstract art evident from around 1910. The omission of clear content themes like portraits, usually as a source of income for artists, accelerated this development. As a result, while the 'what' diminished in significance, the 'how' rose to the fore, causing a large number of individual styles to appear. Now, with a myriad of ways to depict, and with the prominence of abstract art, countless new styles of visually structuring the surface of the canvas developed.

These distinctive features of modern art went hand in hand with the basic market forces in art (Grasskamp, 1989). Nowadays, an artist's success is mainly due to a recognizable and distinctive artistic style. The need to develop individually distinctive styles has forced artists to produce a large number of innovations. The variety of styles and innovations in artworks also has dramatic effects for the perceiver. The borders between art and non-art have been extended and somewhat blurred. Since Duchamp's use of everyday objects or the introduction of temporary performances, artworks have often become difficult to recognize as artworks *per se.* In contemporary art, nearly every conceivable kind of object has been used as art, from artist's blood to elephant dung. As artworks are no longer obvious as such, their initial classification requires adequate context variables.

Moreover, modern art presumably requires a larger need for interpretation than any previous art. Concerning the psychological understanding of aesthetic experience, the better the understanding of an artwork, the higher the probability that it produces aesthetic pleasure. This is highly significant, as the understanding of the piece is no longer finished with just a visual representation of the 'what is depicted'. Conceptual ideas, stylistic reflections and variations, as well as abstract concepts no longer apparent from the appearance of the artwork have become increasingly dominant in contemporary art. This aspect illustrates the importance of top-down influences for aesthetic experiences.

In order to understand how modern art provides aesthetic experiences and what cognitive-processing stages are involved, we present an information-processing model of the aesthetic experience (see Fig. 1). The model is based on the above analysis of modern art and describes a number of processing stages that characterise aesthetic experiences and the formation of aesthetic judgments. The model as it is shown here is mainly concerned with visual aesthetics.

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[1] *The authors are aware that this is a simplified description; there are still schools or groups such as POP ART or COBRA, the abstract expressionists etc. Nonetheless, the number of artists that no longer belong to a school is numerous, although it is not excluded that some retrospective movement labelling may occur in the future.*

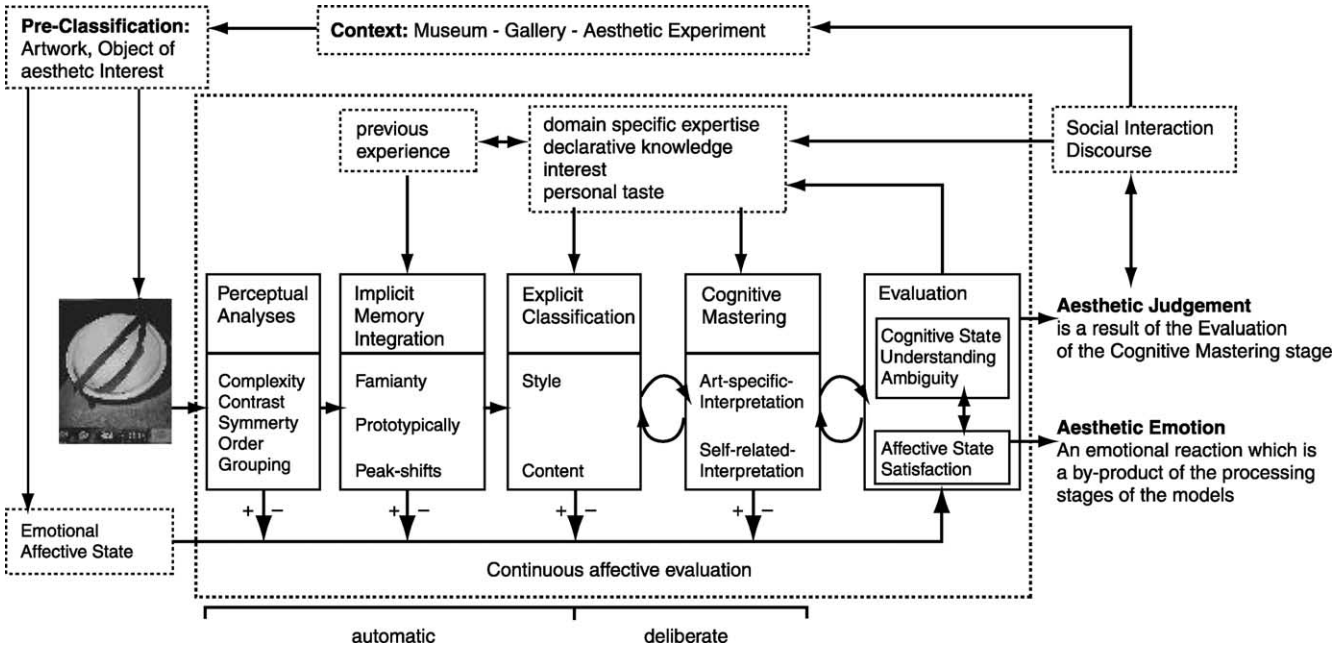

Figure 1. A model of aesthetic experience.

A psychological model of aesthetic experience and judgments

The model proposes a number of processing stages which are involved in aesthetic experience. Moreover, important variables that affect the processes at each stage are discussed. We show how aesthetic experiences provide cognitive and affective processing, which we suppose is somehow art-specific and, in many cases, both pleasing and self-rewarding. Exposure to art provides the perceiver with a challenging situation to classify, understand and cognitively master the artwork successfully. It is this entire process that we call an aesthetic experience. Thus, an aesthetic experience is a cognitive process accompanied by continuously upgrading affective states that vice versa are appraised, resulting in an (aesthetic) emotion. In accordance with Scherer (2003), we assume cognitive and affective experiences to be linked reciprocally. Successful mastery of an artwork is the source of intrinsic motivation to search future exposure (and the challenge) of art in the future. In the long run, this kind of motivation increases interest in art.

Therefore, what is important is the ability of each perceiver to improve his or her ability to master art through the acquisition of expertise. This is referred to in the model as reference to the person's knowledge and the importance of style-related processing. We also propose that this kind of style-related processing is the essential art-specific challenge provided by modern art. There are two distinct outputs of the model: aesthetic emotion and aesthetic judgment. The model is focused on understanding cognitive processes within the cognitive system of the perceiver. Nevertheless, external variables will also be briefly discussed.

In the following sections, the main components of the model are described in detail. Arrows symbolize the flow of information. All boxes contain a header labelling the operations that are made on a specific stage of processing. We propose five stages, each concerned with different cognitive analyses. We suppose that within each processing unit, analyses of the stimulus usually occur simultaneously. For the first two levels we have included a list of important variables, which affect aesthetic processing at these stages. The third level is the first one that provides explicit representations, both of content and style. The variables discussed in each section presumably are not complete, but provide a representative selection. They are discussed in the accompanying text with examples from the literature of empirical aesthetics.

Although we discuss the different components of the model from left to right, it is important to note that the model does not depict a strict serial flow of information. Rather, we propose a relative hierarchy of processing stages, with processing potentially falling back onto previous stages. Importantly, the latter stages of information processes form loops, in order to reduce ambiguity and increase both the understanding and the affective mastering of the artwork. The information processing of the higher stages is particularly dependent on expertise. Therefore, we present examples from the literature to illustrate this.

Context and input of the model

A work of art is the input for the model. Aesthetic experiences often require a pre-classification of an object as art. This pre-classification can be assured by a number of possible context features. The appearance of an object in an art exhibition, in a museum or art gallery is a strong contextual cue for classifying an object as one that warrants aesthetic processing. Some authors have argued that according to Kant's notion, the

perceiver needs to be in a certain state to have aesthetic experiences. Cupchik and Laszlo (1992), for example, called this an 'aesthetic attitude'. Goodman (1976) discussed how such an attitude of distance and disinterestedness affects information processing of aesthetic stimuli.

It is one of the distinctive features of aesthetic experience that it takes place in a rather safe environment (Frijda, 1989). In everyday life, perceivers deliberately expose themselves to art and the affective reaction is experienced in a context encouraging aesthetic processing. Consequently, when conducting experiments, researchers have to ensure that their data is collected in similar environments. Differences between participation in an experiment and visiting an art gallery need careful consideration.

Nonetheless, the context of a laboratory experiment of aesthetic experiences may also provide solutions as long as participants are explicitly told that they are involved in an experiment concerned with aesthetics and art reception. This is important because it somehow assures a more representative mode of art reception. Moreover, according to Frijda (1989), aesthetic experiences are seen as affectively positive. Concerning the development of the affective state due to aesthetic experience, the affective state at the beginning of an aesthetic experience is particularly important. For psychological experiments, we therefore propose considering the affective state of the participants because a negative affective state at the beginning might hinder positive aesthetic experiences. This in turn would conceal important effects in experiments due to a processing which is not representative for aesthetic experience. This affective focus is supported by the findings of Konecni and Sargent-Pollok (1977). They measured aesthetic judgments under varying levels of arousal (according to Berlyne, 1974) *and* induced positive or negative emotions. The emotional state of the participants was a good predictor for ratings of pleasantness in that positive judgments were made under conditions of positive mood. Moreover, aesthetic experience might also change the affective state. When aesthetic experiences often are positive then we expect an increase in positive affect after the processing of an artwork. More recently, Forgas (1995) provided an elaborate theory of when and how mood affects cognitive processing. For example, affective states affect the way an artwork is processed: more holistically when the perceiver is in a positive mood, and more analytically in a negative mood. With respect to empirical studies concerned with aesthetic processing, we therefore assume that aesthetic experience might be hindered by an initially negative mood of the perceiver.

Perceptual analyses

First, the artwork (painting or sculpture) is analysed perceptually. Most psychological work related to artworks has focused on perceptual features specific to artworks (Berlyne, 1974; Ramachandran & Hirstein, 1999; Solso, 1994; Zeki, 1999). However, simple perceptual variables usually affect relatively simple judgments of aesthetic preference. Thus, it was shown how people tend to prefer one object to another, when only one perceptual dimension is varied. A number of perceptual features have been investigated with respect to such aesthetic preferences. Basic occipital visual processing is mainly involved at this stage.

Contrasts are processed very early and somehow contribute to aesthetic preferences (Ramachandran & Hirstein, 1999). Interestingly, even small variations in contrast can affect aesthetic preference. Stimuli can vary in the amount of clarity in representation,

much like blurred versions of photographs. Not only are clearer images often misinterpreted as being more familiar (Kinder, Shanks, Cock, & Tunney, 2003; Whittlesea, 1990), but also they are relatively preferred to less clear versions (Leder, 2002; Reber, Winkielmann, & Schwarz, 1996).

The effect of visual complexity on preferences was investigated in a number of studies (Berlyne, 1970, 1974; Frith & Nias, 1974). Frith and Nias used a variation of a complexity-based, information-theory approach that allows objective measurement of pattern complexity. However, real artworks usually vary on a large number of dimensions. Nonetheless, a medium level of complexity was often found to be preferred (measured by scales or relative preference). This was explained by the arousal potential resulting from visual stimulation, preferred at a moderate level (Berlyne, 1970, 1974). Effects of complexity, however, depend on the adaptation level of a person (Helson, 1964). The arousal approach has more recently been reviewed and rather critically evaluated (Martindale, 1984; Martindale, Moore, & Borkum, 1990). Berlyne (1974) also analysed other psychophysical variables such as intensity, brightness, saturation and size. In a later study, Boselie and Leeuwenberg (1985) discussed the role of conjunctive ambiguity.

Colour is also extracted in early processing of a visual stimulus (Zeki, 1980) and has also been discussed as a variable affecting aesthetic preferences (Maffei & Fiorentini, 1995; Martindale & Moore, 1998). A recent debate was concerned with a critical examination of Kandinsky's hypothesis that basic forms such as circles, triangles and rectangles are most beautiful in certain colours (Jacobsen, 2002). However, concerning 'general laws', these studies yielded rather disappointing results.

Symmetry is also detected very early, both in complex abstract patterns (Julesz, 1971) and in artworks (Locher & Nodine, 1987). It seems that symmetry generally tends to be preferred over non-symmetry (Frith & Nias, 1974). Tyler (1999) investigated the use of this variable in portraits and provided a comprehensive discussion of perceptual symmetry in general (Tyler, 2002).

Grouping and order are also summarized here under perceptual analyses. According to Marr's (1982) theory of vision, these variables are extracted quickly and automatically and are part of the full primal-sketch. Gestalt psychologists have described a number of principles that lead to more or less good gestalts, and Arnheim (1954) explicitly stated that good gestalts are aesthetically preferred. Using real artworks, Locher (2003) recently found empirical evidence for a corresponding theory of visual rightness.

The processing of the perceptual variables proceeds quickly, without effort and is somehow time sensitive. Thus, when presentation time of aesthetic stimuli is strongly restricted, effects of these variables can be analysed (Kreitler & Kreitler, 1984).

Implicit memory integration

Aesthetic processing relies on some implicit memory effects. We call this stage implicit because the results of this processing do not have to become conscious in order to affect aesthetic processing. Ramachandran and Hirstein (1999) and Zeki (1999) have noted that artists often use features which are processed at this stage, and therefore such processing in their opinion bears some aspects specific to art. Importantly some of these 'principles' were claimed to exploit processing means of the human perceptual system (Ramachandran & Hirstein, 2001; Zeki, 1999), justifying their importance for a psychology of aesthetics. Three features that have been discussed as effective in aesthetic judgments are considered below.

Aesthetic preferences are affected by familiarity. Using the 'mere-exposure' paradigm, some studies have found that familiarity through repetition increases the affective preference for a stimulus (Kunst-Wilson & Zajonc, 1980; Zajonc, 1968). Despite being a promising explanation for long-term effects in art appreciation, mere-exposure effects were found with a number of different stimulus materials, but results with artworks were often ambiguous (Leder, 2002; Stang, 1974, 1975). Bornstein (1989) concluded from his meta-analyses that effects with artworks were not at all consistent, although effects of familiarity were found by some researchers either through repetition (Kruglanski, Freund, & Bar, 1986) or by using natural differences (Cutting, 2003; Leder, 2001). Leder has shown that familiarity with van Gogh paintings positively correlates with aesthetic judgments. However, when the paintings were introduced as fakes of van Gogh, the correlations were strongly reduced. Berlyne (1970) considered whether novelty has a natural antagonistic effect on familiarity and that complexity mediates favourable judgments of novel or familiar objects. More recently, Hekkert *et al.* (2003) have investigated the complex interplay of novelty, originality and familiarity in the aesthetic appreciation of industrial design.

An increase in preferences due to mere familiarity can be produced in psychological experiments, but lacks a coherent explanation. Repetition might reinforce positive experiences due to the lack of negative consequences (Zajonc, personal communication) but might also be due to reduced uncertainty. Moreover, explicit familiarity might produce memory associations and affect processing. Martindale (1984) assumed that higher order processes, such as semantic processing, conceal simple mere-exposure effects with artworks in laboratory experiments.

Prototypicality is the amount to which an object is representative of a class of objects. It is built through experience, and a prototypical object optimally represents a class of objects. Preference for prototypicality was often found for facial attractiveness (see Etcoff, 1999, for an overview) and was shown for prototypical colours (Martindale *et al.* 1990). Hekkert and van Wieringen (1990) found that preference for cubist paintings depends on prototypicality, which they defined as the ease of recognition of the depicted object. Prototypicality (like most variables discussed in the implicit memory processing unit) is difficult to measure as it relies on the individual experience of the beholder. However, prototypicality in art presumably is often processed as prototypicality of an artwork for an artist or an art school. Thus, it is likely that expertise might affect the processing at this stage by providing specific prototypes. We are not aware of any study explicitly testing this phenomenon but we would pose that art experts classify examples of modern art initially in respect to an art, style or artists. Lay people with no expertise make no such classification. Although the experimental test remains to be seen, we have included an arrow from previous experiences to this box. As they have been investigated so far, both variables, prototypicality and familiarity, presumably are not exclusive to art.

Ramachandran and Hirstein (1999) discussed basic principles that artists use to optimally stimulate the brain. We have described some of them in the perceptual analyses section above (order, symmetry). Beyond prototypicality and familiarity, Ramachandran and Hirstein also identify the peak-shift phenomenon as one feature in art that is often consciously or unconsciously used by artists and which affects aesthetic preferences. Peak-shift effects describe stronger responses to objects that somehow exaggerate the properties of familiar objects. Caricatures and modes of depiction, which stress the essence of an object, are examples. These principles are frequently used in art, but empirical evidence for their effects in human aesthetics are rare. Similarly,

Zeki (1999) identifies the function of art as a search for essential features. Thus, certain features attract the perceiver because they optimally exploit (or excite) the usual processes involved in the identification of visual stimuli. Both approaches, by Ramachandran and Hirstein (1999) and Zeki (1999), stress the rewarding and pleasing nature of these processes. The principles they discuss are found in many examples of art. However, sometimes they do not apply to contemporary art, which often is abstract or conceptual (Tyler, 1999). As Ramachandran and Hirstein (1999) state: 'one potential objection might be that originality is the essence of art and our laws do not capture this' (p. 50). Our model addresses this challenge by proposing that a more comprehensive understanding of aesthetic experience is needed. Approaches to empirical aesthetics have to expand these previous approaches with components that can also explain aesthetic experience of art that is non-representational or even conceptual.

Explicit classification

Central for a model of aesthetic experience is processing which is at least art-related. At the stage of 'explicit classification', processing is particularly affected by the expertise and knowledge of the perceiver. Explicit classifications are deliberate and can be verbalized.

Analyses on this level are concerned with content and style. When expertise and art knowledge are limited, then the output of this stage presumably is in terms of what is depicted, resulting in statements such as 'a landscape', or 'a colourful patch of forms'. With an increase in knowledge, other solutions to the question of 'content' are more likely. We believe that with expertise, the artwork, its historical importance, or the knowledge about the artist also become the content of the aesthetic object. For example, for a naïve perceiver, Monet's painting *La Gare St Lazare* (1877) is a depiction of a train station. For a more experienced perceiver, it has a different explicit content. It is classified as an Impressionist painting that reveals visual properties of light, scattered by steam. We have already discussed that for experts prototypicality is probably concerned with prototypes of single artists or art schools. Thus, this level of processing might overlap with the preceding processing stage. Presumably, expertise then changes the outcome of the explicit classification stage. Similarly, with increasing art expertise, the initial representation of context presumably shifts from the 'what is depicted' to a classification in terms of art-specific classifications. But how is this classification achieved?

Our analyses of modern art revealed that the need for innovation has resulted in a huge variety of art styles representing schools of art or even single artists. To understand and appreciate art, a perceiver profits from the processing of these art-inherent features. It seems that in the 20th century, recognition and understanding of individual style have become essential for aesthetic experiences. Thus, an aesthetic experience involves a processing of stylistic information. Cupchik (1992) described how style processing in abstract art depends on expertise, when he states that 'Even highly abstract paintings can be constrained by rules, although the underlying principles are not immediately evident to those outside the artist's circle' (p. 89). Concerning classifications of historical styles in art, Hasenfus, Martindale, and Birnbaum (1983) showed that naïve participants successfully classified artworks of different media according to historical classes such as baroque or rococo. Hasenfus *et al.* (1983) concluded from their findings

that 'even naïve observers tend to decode or understand works of art at a deeper level than might be assumed' (p. 861).

Although we have placed stylistic processing in a box of explicit classifications, there is evidence that stylistic knowledge can also be acquired implicitly. Gordon and Holyoak (1983) found that implicitly recognized style, which was operationalized in terms of generalized construction rules, increased simple preferences. However, we have put style-related processing on the explicit stage because its outcome can often be explicated. Without explicit learning about art styles, artworks are difficult to classify (Hartley & Homa, 1981). Explication of an artist's style is representative of the elements usually taught at school or acquired with expertise in discourses on art (Parsons, 1987).

However, recognition of a style does not exclusively exist in the domains of art. Other objects which are classified according to surface details might also require similar cognitive processes. There is something rather exclusive in modern art. Since the emergence of abstract art, art has provided objects that are differentiated only on style of depiction rather than content.

Beyond style processing, art provides another psychologically relevant experience: the pleasure of generalization. Once a concept of an artistic style is learned, the perceiver is then, based on a generalization of style (Hartley & Homa, 1981), able successfully to recognize new examples he has never seen before. Gordon and Holyoak (1983) argued that the generalization of knowledge to new, unfamiliar styles might be important for aesthetic appreciation. Thus, both processes together, style processing and generalization provide a situation in which new classifications can be gathered from unfamiliar stimuli. Declarative art knowledge and experience improve these processes. The recognition of style of new exemplars in art using style generalization relies on abstraction of the mode of depiction. This differs, for example, from the peak-shift, which exaggerates a stimulating pattern in a relatively predictable way. Artists' styles now vary from each other in every direction and this wide range of potential styles provides an inexhaustible reservoir of possible aesthetic experiences.

Another process a perceiver might use to identify an artist's style is to recognize alienation. Alienation can be discovered by explicitly comparing the output of the content classification with its specific depiction. Thus, alienation is a feature of many artists' styles which systematically changes the identification of a depicted object. It only plays a minor role in abstract art. Yet, whenever the content of an artwork is identifiable, a measure of alienation is possible. Using portraits, Leder (1996) revealed how a transformation into a line drawing alienates the portrayed person. Thus, a simple measure of deviation when the depicted object is known reveals a description of a specific stylistic alienation. The results of the explicit classification stage can be investigated by directly asking for the content or meaning or style of an artwork.

As shown in Fig. 1, the ability to process style as well as the next stage of cognitive mastering depends on a person's knowledge. As a result, comparing expert and naïve perception is the major source of evidence for these levels of processing. Winston and Cupchik (1992) have provided a detailed analysis of expertise effects in psychological aesthetics. Leder (2002) has claimed that it is the enormous amount of information one can learn about art that is important, as it offers an unlimited pool of knowledge to improve discrimination skills. Expertise in art consists of information that supports cognitive processing. Therefore, investigations of aesthetic experience that explicitly measure art knowledge seem to be warranted in empirical studies.

Cognitive mastering and evaluation

In the previous section we discussed why we believe that style-related processing is so important in aesthetic experience of modern art. Successful classification of style presumably provides self-rewarding cognitive experiences. Gordon and Holyoak (1983) also assumed this. Thus, it seems to be an important element in solving the question why people search for aesthetic experience.

The processing stages Cognitive Mastering and Evaluation are closely linked as these two build a feedback-loop. The results of the cognitive mastering stage are permanently evaluated in relation to their success in either revealing a satisfying understanding, successful cognitive mastering or expected changes in the level of ambiguity. Thus, the evaluation stage guides the aesthetic processing by measuring its success. Moreover, through the backwards-loop, it further initializes information processing. When the evaluation is not subjectively experienced as successful, the information processing can be redirected to the previous stages. We claim that expertise is also reflected in the quality of this feedback-loop. Art experts process artworks using style and visual features of the artwork, while naïve viewers more often refer to content or external referents (Parsons, 1987; Winston & Cupchik, 1992).

A kind of cognitive mastering somehow is inherent in several psychological and philosophical theories of aesthetic experience. Fechner in 1871 already restricted his empirical work in aesthetics mainly to what he called the aesthetic from below. This would nowadays corresponds to bottom-up processing and, in our model, corresponds to the earlier stages of processing. Realizing that taste and knowledge affect aesthetic experiences with real art, he summarized these variables as aesthetics from above. In modern terms, Fechner's ideas have been reflected as search for meaning, cognitive interpretation and orientation (Kreitler & Kreitler, 1972; Martindale, 1984). Similar concepts were proposed by Dewey (1934), who stated that the beholder must 'create his own experience' in an 'act of abstraction, that is of extraction of what is significant' (p. 54).

A relatively simple way of gathering understanding is the formation of self-related cognitive information. This is often applied by naïve perceivers who associate the content of an artwork with their situation and their own emotional states (Parsons, 1987). For example, a rather naïve perceiver might be satisfied with the recognition of the train station in Monet's *La Gare St Lazare*, because 'he likes trains because they remind him of a journey'. More generally, Martindale (1984) has explained those processes which elicit pleasure and understanding by the number and diversity of associations activated by a stimulus. In his terms, semantic associations and their episodic memory associations reflect the understanding of an artwork.

The importance of understanding directly refers to the distinctive feature of modern art. Modern art somehow provides a need for interpretation, which, if carried out successfully, is experienced psychologically as emotionally positive. Moles (1968) described the challenge of modern art as a need to develop adequate skills in order to understand an artwork semantically and aesthetically. While the former refers to content, the latter requires processing of style and art-specific knowledge. Tyler (1999) presented an argument which is in accordance with our model: Modern art provides such a large number of varieties in styles, which require the perceiver to invest great effort to extract meaning, that the aesthetic experience can be understood as a challenging perceptual problem-solving process. Modern art allows a very differentiated search for meaning, linking perceptual-based analyses (by processing style and visual properties of

a painting) with a search through concepts that a perceiver has adopted through previous experience and explicit knowledge (Zeki, 1999). Thus, modern art empowers loops of processing in which hypotheses concerning the meaning of an artwork are continuously altered and tested until a satisfactory result is achieved. The processing of these loops can be pleasing itself and essential for aesthetic experiences.

Several researchers have stated that understanding of an artwork results in an activation of the rewarding centers in the brain (Maffei & Fiorentini, 1995; Zeki, 1999). Ramachandran and Hirstein (1999) expressed the idea in one of their laws of aesthetic experience, claiming that the solving of perceptual problems is self-rewarding. Future neuropsychological research is one method to reveal whether successful cognitive mastering indeed affects the rewarding centers of the brain. To our knowledge, adequate studies are still rare. However, Blood and Zatorre (2001), testing emotional responses to 'favourite music', provided the first empirical evidence that strong aesthetic experience is associated with activation of such areas of the brain. This activation is responsible for affective and emotional processing and is similarly rewarding during experiences of consuming chocolate or enjoying sexuality.

Our model has explicit links to declarative knowledge, domain-specific knowledge and personal taste. The more expertise a perceiver acquires, the more differentiated and presumably more rewarding aesthetic experiences might be. Thus, the self-rewarding character of art processing also explains why perceivers continue to perceive art. The persistence of artists producing new and innovative styles guarantees that challenging aesthetic experience remains possible.

The importance of top-down knowledge was also discussed by Cupchik (1992) who investigated the effect of expertise in a number of studies, and also concluded that style-based processing is a sign of expertise (Winston & Cupchik, 1992). Temme (1992) has shown that the amount of information about the art affects aesthetic experiences in museums. In accordance with our model's predictions, he states, that appreciation can be enhanced by explicit information about the artists and their cultural background. Another line of evidence for top-down effects of interpretation and classification stems from studies investigating so-called elaboration effects. Millis (2001) reported that aesthetic ratings for photographs increased when elaborate titles were added. It is argued that the addition of a title helps to find meaning and presumably reduces uncertainty. Russell (2003) reported similar results using artworks. Leder (2001) also reported top-down effects in a series of experiments in which information about the authenticity of the stimuli affected the interdependence of familiarity and liking.

What are possible levels of expertise that affect aesthetic experiences? Parsons (1987) has proposed five different stages of processing artworks similar to developmental stages. His approach is based on interviews, and the stages describe different ways of dealing with artworks. Somehow these different levels bear some similarity to what we call cognitive mastering and provide elaborated version of different qualities of cognitive mastering. Responses at the first stage of his model, called favouritism, are mainly based on content, but somehow link content with personal beliefs. We call this self-related processing. References to beauty and explicit realism in depiction is distinctive for stage two. Expressiveness on stage three is empathic, considering what the artist might have felt and thought while producing the artwork. Stage four is similar to our level of explicit, style-related classifications where perceivers focus on style and form. Only at stage five, autonomy, are the underlying concepts and the autonomy of the artwork analysed. Apparently, these descriptive stages correspond to the processes and analyses of cognitive mastering described in our model.

Parson's stage-model implicitly proposes an ideal or adequate processing of art. Cupchik (1992) also implicitly states that there is presumably one adequate interpretation of the artwork shared by the artists and its viewer when the viewer perceives the underlying structure. We want to suggest that art provides numerous solutions to the problem of meaning assignment. Thus, in every case the internal evidence measured at the evaluative levels determines the aesthetic experience. This is an important difference between art and non-art and also refers to the cultural context that gives new meaning to artworks when fashions and attitudes change.

We have included personal taste as a variable that affects aesthetic experiences. This seems to be warranted, as personal taste—even if this sounds remarkable—is one of the problematic variables in experimental aesthetics. Personal taste can produce stereotypical responses that conceal effects of stimulus variables of interest to the researcher. Particularly with modern art, rather naïve viewers might tend to use such stereotypes and therefore not pass through all stages of the model. They may not rely on the outcome of all stages in their aesthetic judgments. For example, a classification of an artwork as 'abstract' might prevent further search for meaning. Moreover, judgments of social desirability might also rely on such stereotypic classifications. Importantly, personal taste can also strongly influence the aesthetic judgments of experts who might dislike certain styles. Nonetheless, there are a number of studies which have investigated inter-individual differences and preferences for art (e.g. Furnham & Walker, 2001; O'Hare, 1976). It is difficult, though not impossible, to control the effects of these variables in laboratory experiments.

Ambiguity is another measurement shown in the evaluation box. Ambiguity was often proposed to be the cognitive result which triggers further processing of the stimulus until ambiguity itself is reduced (Cupchik, 1992). We have included this variable because it explains that the need for understanding is neither trivial nor guaranteed. Ambiguity might therefore be an informational state that needs resolution and causes further information processing. We do not believe that ambiguity in art needs a complete resolution. It might be an art-inherent feature that a residual ambiguity might be left open and accepted by the perceiver. This is likely because otherwise it would have to be assumed that there is only one correct solution to the challenge of art. This is not the case. Artworks can often be experienced aesthetically several times, yielding different solutions like, for instance, when the artwork is perceived again with more expertise.

Affective and emotional processing

Besides the cognitive-processing stages reported so far, aesthetic experience is affective or even emotional (Blood & Zatorre, 2001; Frijda, 1989). In our model there is a continuous development of changes in the affective state. We have already assumed that the typical affective state when entering an art-related situation, such as an exhibition, is positive. Moreover, we believe that the perceiver can continuously access the outcome of affective evaluation. We propose that the result of every processing stage in our model can increase or decrease the affective state. Ongoing success in cognitive mastering results in positive changes of the 'affective state', leading to a state of pleasure or satisfaction. According to Dewey (1934) 'conversion of resistance and tension . . . into a movement toward an inclusive and fulfilling close' (p. 56) is the very aspect that makes an experience an aesthetic one, for example an experience attended by 'peculiar satisfaction' (p. 12). Thus, we believe that the perceiver somehow

evaluates his affective state and uses this information to stop the processing once a satisfactory state is achieved. This emotional measure somehow is similar to what Kreitler and Kreitler (1972) described as a moment of homeostasis.

In certain cases, the emotional state attending aesthetic experiences can even extent to what Csikszentmihaly (1999) termed *experience of flow*, a strong, positive emotional state which bears strong, intrinsic motivational potential.

The continuous build-up of affective states has important implications for affective reactions to art and their measurement in empirical studies. For example, if the process of aesthetic processing is disrupted, affective judgments are still possible. There has been a long debate on whether affective processing precedes cognitive processing (Kunst-Wilson & Zajonc, 1980; Lazarus, 1991; Zajonc, 1984). Mandler and Shebo (1983) used real artworks, renaissance, representative modern and abstract paintings and found no evidence for a precedence of aesthetic judgments over cognitive (recognition) judgments. In everyday life aesthetic experience is a time-consuming process, and it seems that visual and cognitive judgments are inherent in the processing which results in an aesthetic emotion and, if required, in an aesthetic judgment. Concerning the duration of aesthetic experiences, Smith and Smith (2001) reported that the mean time of perceiving artworks in the Metropolitan Museum was 27 seconds. From the Affect Infusion Model (Forgas, 1995) it is likely that the mood at the beginning of an aesthetic experience affects the quality of aesthetic processing. According to this theory positive affect supports a holistic mode of processing, which is based in memory on activation of wide semantic fields in contrast to negative affect which leads to a processing characterized by a more restricted spread of activation to close associates. However, whether this is the case in aesthetic processing has not yet been investigated. More generally, the possibly positive affect when people deliberately search for aesthetic experience makes it likely that often-positive emotional experiences should occur.

The model's output

We distinguish two outputs of the model, aesthetic emotion and aesthetic judgments. These two are relatively independent in our view. Aesthetic emotion depends on the subjective success of the information processing and is often described as pleasure or happiness, but can also be negative in case of unsatisfactory processing. Thus, the output emotion results from affective effects and their cognitive appraisal, particularly in the evaluation stage (Scherer, 2003). The dissociation between judgments and emotional state can be illustrated when, for example, an experienced viewer comes to the judgment that the painting she or he is asked to judge is a poor example of a certain painter. This does not exclude that the process that produced that judgment was not rewarding and experienced as affectively positive. However, more naïve perceivers presumably show a stronger interdependence of both outputs. Asking how pleasing an artwork is refers to the aesthetic emotion. Liking and preference on the other hand might be differentially related to either output.

An artwork is judged as positive if the process it elicited is experienced as emotionally positive. Cupchik and Laszlo (1992) distinguished a *pleasure-based* and a *cognitive-based* way of reception of art. They claim that rather naïve persons refer more to a direct emotional mode of reception, while experts are challenged by a more cognitive reception.

The independence of the two aspects also explains why it is sometimes so difficult to test aesthetic processing theories in the laboratory. Different dependent variables can be measured. For example, when interestingness or beauty are measured, then presumably the more cognitive aspects of the aesthetic judgments are considered, whereas pleasingness probably reflects more of the aesthetic emotions (including involvement).

Often aesthetic judgments are the only dependent measures and therefore mainly the object-related cognitive part of aesthetic processing is reflected in the data. In laboratory studies aesthetic processing has often been measured using scales or responses for which the experimenter set the criterion. Most often the beholders were asked about how beautiful or liked an artwork was (Berlyne, 1974; Eysenck, 1968; Fechner, 1871; Leder, 2001), or which of two objects they preferred (Kunst-Wilson & Zajonc, 1980). We claim that aesthetic judgments are the result of the measurements in the evaluation block. These are, in turn, based on the success and evaluation in the cognitive mastering stage. When a perceiver comes to the conclusion that artwork is not well done, not meaningful, or not producing clear associations, then the judgment is negative and the artwork is not preferred. In the past researchers often measured aesthetic judgments after an incomplete processing of the aesthetic object. In this case, we assume that the perceiver judges on the basis of continuously upgrading affective information, using heuristics such as the affect-infusion heuristic or the affect-as-information heuristic (Schwarz & Clore, 1983).

Aesthetic experience has self-reinforcing qualities. We claim that this is a by-product of the processing stages of our model. This is similar to the approach of Apter (1984), who classified art as distinctive because it is not explicitly goal directed, but more focused upon the activity rather than the goal of the action. While we believe that an aesthetic experience is often pleasurable *per se*, it can also result in displeasure. For example, when it is not possible to understand the artwork, or when adequate top-down information about the concept and possible meaning are not available, displeasure results and the aesthetic judgment might also be negative. Interestingly, the occurrence of displeasure seems to be even more likely in the laboratory in which participants of experiments are requested to process a number of stimuli. In locations like museums, the likelihood is greater that the perceiver stops the information processing after a self-paced time due to a low level of interest. He or she simply turns to the next artwork before the development of explicit displeasure. Aesthetic emotions have only rarely been directly measured (see Blood & Zatorre, 2001, for an exception). Explicit measurements of aesthetic pleasure might be provided by neuropsychological means. Changes in arousal that correspond to predictions about aesthetic experience might also be measured through peripheral variables such as galvanic-skin-response, as was proposed by Ramachandran and Hirstein (1999).

Other components

The acquisition of knowledge about art, the finding of meaning and the evaluation of meaning are all possibly affected by social processes (see Crozier & Chapman, 1984, for an interesting discussion). In many respects, art serves social functions, and the need for interpretation might increase the importance of processes such as discourse and peer group and social class influences (Bourdieu, 1979). Our model is mainly concerned with those processes that art produces for an individual. As a result, social processes are neglected here though they may be the topic of future research.

The self-referential character of modern art has often been stressed in art history. Though not included in the model, we believe that this kind of reflection is part of the interpretation and search for meaning component. It is plausible to assume that the more relevant a stimulus, the more positive the processes that contribute to a positive aesthetic experience. This again is a component that needs further examination in the future. Both components need to be considered for practical recommendations derived from our model.

Generalization to other domains and experiences

In the introduction we explained that the model in its present form is mainly concerned with visual arts and identifies components in the aesthetic experience which are particularly eminent in the experience of modern art. However, the processes as they are described here will somehow also occur in the processing of other aesthetic stimuli. Specific for many forms of visual art is the combination of visual processing, extraction of meaning and resolution of ambiguity. We assume that classical, representational art and most kinds of sculptures are processed in a similar way, while in representational art the content is accessible more easily. Yet, expertise allows for a cognitive mastering based on knowledge that is very similar to the kind of mastering proposed in the case of modern art. Aesthetic appreciation of design, for example, also follows similar principles (Hekkert *et al.*, 2003; Leder & Carbon, in press). In music, style is even more prominent than in most forms of visual art, but the processing is strictly temporal. Different sorts of art represent different kinds of semantic meaning. Rather concrete semantics reveal representational art, literature and film while modern dance, abstract art and classical music are rather low on this dimension. Situation and context are presumably more important in opera and theatre and less important in books and music and any kind of art consumed from media. Future research will also show differences between different classes of objects, and we are confident that the present model provides valuable information-processing stages which might reveal object-specific aesthetic experiences.

The future of the model

Our model of aesthetic processing therefore gives researchers a number of possibilities for validation. However, it needs to be tested, in which respects the model will need refinement in the future. In order to test the model there are some possible challenges. First, an important prediction is the possibility that aesthetic emotion and judgment diverge in some situations. Particularly the dependence of such a divergence on expertise must be tested. One difficult question for future research is the interdependence between pleasure, interest, affective and cognitive judgments. The model's predictions concern dependencies of affective states and judgments as a result of successful or unsuccessful cognitive mastering. This could be tested using psychophysiological measures of affective states.

The importance of the pre-classification has already been addressed in a study by Leder (2001). Telling participants that artworks are fakes rather than original paintings by van Gogh affected the influence of familiarity on aesthetic judgments. As some relations are clearer than others we believe that the present model provides a valuable framework for future investigations.

The time course of the processing levels is another question for future research. Although we have presented some kind of serial information flow, we do believe that during the aesthetic experience feedback-loops are possible. The nature of this information processing requires studies with restricted presentation times, but neurobiological methods might also uncover the flow of information.

General conclusion

Aesthetic experience is particularly interesting for psychologists because it consists of cognitive and emotional processes evoked by the aesthetic processing of an object. Empirical studies in aesthetics using real artworks have often revealed rather disappointing results. This has often been seen as the source for pessimism in establishing models of aesthetic experience based on empirical results. We hope that the present model is a valuable basis for future research. Regarding the specific influence of the earlier processing stages, there are two ways in which their effect can be tested. First, a reductionist use of stimuli that vary systematically only in one dimension, such as colour or familiarity, can reveal effects in terms of preference. Secondly, by inducing temporal restriction, the experimenter can measure outputs in terms of preferences at different stages of the information processing. Some of the early processing units can be measured by using very restricted presentation times (Bachmann & Vipper, 1983; Kreitler & Kreitler, 1984). However, Bachmann and Vipper showed that many dimensions of artworks are available quite quickly. With variation of presentation time, Leder (2001) showed that when presentation time increased from 1 to 5 seconds, the effects of familiarity and liking of van Gogh paintings were no longer found.

Nonetheless, aesthetic experience requires sufficient time to allow the full processing as it is proposed here. The approach described above offers an alternative. If the variables depicted in the model are explicitly measured, a control of disruptive conditions should be possible. Thus, the model affords researchers the flexibility to consider and control variables such as level of expertise and affective state. We believe that the model in its present version can generate fruitful future research which will also yield empirical tests of the model's limits. Now researchers have the opportunity to empirically investigate effects in aesthetic experiences that in the past might have been systematically concealed.

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