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Perceptual, Semantic and Affective Dimensions of Experience of Abstract and Representational Paintings

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In this study the difference between representational and abstract paintings in judgments on perceptual, semantic and affective dimensions was investigated. Two groups of participants judged the sets of representational and abstract paintings on three groups of dimensions: perceptual (Form, Color, Space and Complexity), semantic (Illusion-Construction of Reality, Expression, Ideology and Decoration), and affective (Hedonic Tone, Arousal, Relaxation and Regularity). The results have shown that representational paintings have higher judgments on the perceptual dimensions of Form and Complexity, the semantic dimension of the Illusion of Reality (the opposite pole of the Construction of Reality), and the affective dimension of Regularity. On the other hand, abstract paintings have higher judgments on the perceptual dimension of Color, the semantic dimensions of Construction of Reality (the opposite pole of the Illusion of Reality) and Expression, and the affective dimension Arousal. A discriminant analysis indicated that all three sets of dimensions are relatively good predictors of the classification of representational and abstract paintings (61–100%). The results suggest that the subjective categorization of paintings is generally based on the recognizability of pictorial content (representational vs. abstract), but some formal or stylistic properties play a role in the categorization, as well: some expressionistic representational paintings were classified in an abstract category, and some geometrically abstract paintings were classified as representational.

Key words: representational and abstract paintings, perceptual, semantic and affective dimensions

The relationship between experiences of representational and abstract paintings was investigated in many empirical studies. Some of these studies were focused on the perceptual aspect of the experience of abstract and representational paintings, such as the sensitivity for the paintings orientation or mirror inversion (Hekkert & van Wieringen, 1996; Lindauer, 1987), the successive contrast effect for the judgment of abstraction in paintings (Elbert, Temme, & Gieszen, 1995;

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Specht, 2007), the perception of the hierarchical structures in paintings (Avital & Cupchik, 1998) and the perceptual experience of the specific categories of paintings (e.g. Mondrian's paintings, see McManus, Cheema, & Stoker, 1993). Some fMRI studies specified distinct cortical areas which correspond to the processing of abstract vs. representational paintings (Kawabata & Zeki, 2004; Lengger, Fischmeister, Leder, & Bauer, 2007; Vartanian & Goel, 2004; Vogt & Magnussen, 2005). Other studies were oriented towards the higher cognitive processes involved in the appraisal of paintings, such as the effect of the titles on the understanding of the meaning of abstract and representational paintings (Leder, Carbon, & Ripsas, 2006; Russell, 2003; Russell & Milne, 1997), and the effect of the social context on the appraisal of abstract art (Ullan & Belver, 1999). Some studies have shown a consistent preference of representational over abstract paintings (Boselie & Cesaro, 1994; Feist & Brady, 2004; Heinrichs & Cupchik, 1985). Also, there are studies interested in the personal correlates and group differences in the affective response and the preference of abstract versus representational paintings. These studies found the significance of openness to experience for the preference of abstract paintings (Feist & Brady, 2004; Rawlings, 2000, 2003), cross-individual variability for the preference of abstract paintings (Vessel, & Rubin, 2010) and sex differences in the preference (females rated both abstract and figural paintings more pleasing than males, cf. Neperud, 1989). Studies of the role of art expertise found that experts preferred abstraction over figural representation (Hekkert, 1995; Hekkert & van Wieringen, 1996; Neperud, 1989) and in a higher amount used a global viewing strategy for abstract paintings compared to non-experts (Zangemeister, Sherman, & Stark, 1995). On the other hand, Augustin and Leder (1996) found that both experts and non-experts used the dimension abstract–representational as an important categorization principle for paintings.

In the present study we attempted to encompass the widest possible spectrum of experience of abstract and representational paintings within a unique conceptual and metric framework. The basic domains of this framework were (1) perceptual (the perception of the physical features of paintings), cognitive or semantic (the understanding of the information that paintings transmit) and affective (e.g. the subjective impression of the painting's affective qualities such as pleasure, disturbance, warmth etc). The metric basis of this framework was the semantic differential scaling paradigm, that is the description of the three domains of experience by using sets of bipolar rating scales.

Before we present the principle ideas of this framework in more details, the notion of abstract art and its relationship with representational art will be defined and shortly discussed.

Abstract visual art could be defined both negatively and positively. The negative definition tells us what the abstract art is not: it is the art whose content does not represent anything recognizable in the visible world, that is any object, scene and event as we see it. According to this, abstract art has alternative

"negative" names such as non-objective, non-figural or non-representational art. On the other hand, the positive definition specifies what the content of abstract visual art is: it is a pattern, a structure or a composition of lines, shapes, and colors (for review, see Gooding, 2000; Moszynska, 1990; Perry, 2005). In respect to these definitions the difference between abstract and representational art seems very clear. For instance, Mondrian's or Rothko's paintings are without doubt abstract because their content is composed of shapes which do not depict anything with an identifiable reference in the natural world. On the other hand, in some paintings such as Eugen Delacroix's painting *Liberty leading the people* we clearly see the scene composed of people in action: every line, shape and color is subordinate to the representation of the depicted scene. However, the difference between representational and abstract paintings is not as clear as it may seem. Namely, some representational paintings such as the above-mentioned Delacroix's artwork may convey the information on a highly abstract, conceptual and metaphoric level. Having this in mind one can say that Delacroix's intention was not to create a group portrait depicting the exact appearance of the concrete people in the scene, but rather to represent something more abstract and conceptual such as the struggle for freedom and the rise against tyranny. The depiction of imaginative and fantastic objects such as creatures that do not really exist (e.g. unicorns, dragons etc) or even pure playing with some perceptual phenomena such as ambiguous figure-ground organization, impossible objects and the like (e.g. Dali, Magritte etc) is amongst the problematic questions of figural representation.

Between total abstraction and naturalistic representation there are many intermediate and ambiguous cases. A well known intermediate form is a semi-figural abstraction, that is the representation of recognizable objects and scenes in a more or less stylized manner (e.g. Picasso, Klee, Haring, etc). The second intermediate form is a pseudo-figural or indeterminate representation which suggests voluminous natural forms (e.g. bodies, clouds, buildings, mountains, etc), although really nothing is actually represented (cf. Fairhall & Ishai, 2008; Ishai, Fairhall, & Pepperell, 2007; Pepperell, 2006). The next intermediate form is an unusual figural representation which results in the difficulty or even impossibility of the identification of a pictorial content. For instance, some works such as photographies can be extremely naturalistic, but at the same time they look abstract and non-representational due to the unusual viewing angles, magnifications and the like (e.g. photographs of the micro and macro cosmos).

The problem of the distinction between abstract and representational art is not only descriptive and phenomenological, but it is also placed in the core of some theoretical discussions within the psychology of art. In the psychology of art there are two major approaches to the problem of pictorial representation and abstraction. The first is Arnheim's perceptualistic approach which argues that in all visual arts, even in completely abstract paintings, the artist depicts what he or she sees (Arnheim, 1949, 1969, 1980). According to Arnheim, in

the visual world we see the so-called structural forces and dynamic expressions of the perceptual Gestalt such as branching, meandering, crawling, jumping, and so on. All those structural and dynamic qualities could be transposed from the perceptual to the pictorial domain equally effective in both figural and abstract art. The second approach to the problem of pictorial representation and abstraction is Gombrich's conceptualistic theory in which art was specified as a conventional, language-like system (Gombrich, 1972, 1973; see also Black, 1972; Kreitler & Kreitler, 1972; Penrose, 1973). Gombrich held that even highly realistic and naturalistic paintings were not the illusions or copies of reality, but rather constructions of new realities in which certain elements and rules of artistic language were used.

Regardless of the differences in the notion of giving the primacy to perceptual or intellectual processes, Arnheim and Gombrich agree in one point: in representational paintings artists do not copy, but rather suggest reality using different ways of representation, that is characteristic artistic styles. In other words, besides the problem of objective pictorial denotation (the represented content), the problem of subjective stylistic articulation (the form of expression) becomes equally, if not more interesting. Berlyne and Ogilvie (1974) and Cupchik (1974) created a list of psychologically relevant stylistic properties of paintings. In this list three different categories of properties could be identified: perceptual properties (the importance of colors, shapes, etc.), affective states (e.g. tense-loose), and higher-order information (e.g. the artist's beliefs or thoughts).

In our previous studies (Marković, 2006; Marković & Radonjić, 2008; Vasić & Marković, 2007) we investigated the structure of judgments of the stylistic features of paintings using the methodology which Osgood and his collaborators used in the construction of the Semantic Differential (Osgood, Succi, & Tannenbaum, 1957; Osgood, May, & Miron, 1975). In his studies Osgood asked the participants to judge verbally expressed concepts on bipolar seven-step scales with opposite adjectives on the poles (e.g. pleasant-unpleasant, strong-weak, passive-active, etc.) and after a factor analyses of elementary judgments he extracted three relatively stable factors: Evaluation, Potency and Activity. A similar approach was applied by Berlyne and his associates, but in the field of the judgments of paintings and other visual stimuli (Berlyne & Ogilvie, 1974; Cupchik, 1974). We used Osgood's but not Berlyne's methodology because Berlyne's approach was not completely empirical. For instance, Berlyne and Ogilvie (1974) generated their set of twelve stylistic properties holding certain theoretical hypotheses and *a priori* criteria: eight scales were suggested by information-theoretic analysis of artistic styles (scales which referred to semantic, syntactic and expressive information), and four scales referred to physical features of paintings (dominance of color, lines, shape and texture). In the same study (Experiment 2) Berlyne and Oglivie (1974) used different criterion for generating the scales: the scales were divided into two *a priori* defined classes, such as collative or descriptive scales (e.g. complex, orderly, etc)

and affective scales which included evaluative scales (e.g. pleasing, beautiful, etc) and the scales descriptive of the subject's state (e.g. tense, discomfort, etc). Contrary to Berlyne's method, Osgood's approach to the affective (connotative) meaning was completely empirical. The representative descriptors of affective meaning were selected from the most frequent adjectives that subjects produced in their description of different concepts. A selection of the objects of judgments (i.e. the concepts in case of Osgood's Semantic Differential study) was also made with intention to be as representative as possible, that is to cover the widest possible range of various categories.

Such a method of selection of elementary dimensions and concepts enabled extraction of the factorial structure, which provides a ground for generalization.

Accepting this logic, in our previous studies we specified three basic factorial structures underlying the perceptual, semantic and affective aspects of style in paintings. In all these studies, the stimuli were selected to be as representative as possible including representational, stylized and abstract paintings (see more in Marković & Radonjić, 2008). In the following paragraphs we outline the basic conceptual and metric framework of the current study. As it was already mentioned, it includes three domains: perceptual, semantic and affective.

DIMENSIONS

Perceptual dimensions

four basic dimensions of judgments of the perceptual dimensions of style were extracted in a factor analytic study (Marković & Radonjić, 2008). These dimensions covered the main domains of visual perception, such as Form (precise, neat, salient form, etc.), Color (color contrast, lightness contrast, vivid colors, etc.), Space (voluminosity, spatial depth, oval contours, etc) and Complexity (multicolored, ornate, detailed, etc). There is a similarity between these dimensions and factors obtained in previous studies of the stylistic properties of paintings. For instance, our factor Form is very similar to Berlyne's and Ogilvie's (1974) Classicism/Order, our factor Color is similar to their Expressionism, and so on. Speaking in terms of classical aesthetic dichotomies, the factor Form may be taken as a good term for the so-called linear style, and the factor Color for a painterly style (Wölfflin, 1915/1950). However, in our study these two factors were orthogonal, whereas linear and painterly styles were defined by Wölfflin as poles of a single dimension.

Semantic dimensions

In our previous studies we studied the judgments of the informational content of paintings (cf. Marković, 2006; Vasić & Marković, 2007). Factor analysis of judgments of "what message the artist wanted to transmit" yielded four dimensions were obtained. (1) The bipolar dimension: the Illusion of

Reality (i.e. an exact optical representation of the external world) vs. the Construction of Reality (i.e. experiments with colors and shapes); (2) Expression (i.e. expression of emotions, fantasies and the like); (3) Ideology (i.e. historical events, transmission of religious messages); (4) Decoration (i.e. production of beautiful and pleasant objects). All these results are very close to Berlyne's (1971) definition of the four kinds of information carried by paintings: semantic (object representation), expressive (emotional), social (cultural) and syntactic (structural) information. These four dimensions are similar to the factors of stylistic ratings that were obtained in the study of Berlyne and Ogilvie (1974). In two experiments Berlyne and Ogilvie (1974) obtained two factorial structures. The first factorial structure consisted of the factors Subjectivism (e.g. importance of emotions), Realism (e.g. importance of reproduction), Classicism (e.g. importance of composition) and Impressionism (e.g. importance of the surface). The second structure included the factors Classicism or Order (composition, lines, orderly, etc.), Complexity or Curvilinearity (curved, complex, emotions), Realism vs. Subjectivism (reproduction vs. imagination) and Expressionism (bright, emotions). Cupchik (1974) obtained similar factors: Classicism (e.g. importance of the composition), Subjectivism (e.g. importance of the artist's perception), Complexity (e.g. scale simple-complex) and Expressionism (e.g. importance of the artist's feelings).

Affective dimensions

In our study of the affective aspect of the subjective experience of paintings four basic factors were obtained: Hedonic Tone (beautiful, pleasant, healthy, etc), Arousal (impressive, strong, interesting, etc), and Relaxation (calming, warm serene, etc), and Regularity (arranged, precise, regular, etc) (Marković & Radonjić, 2008). These results showed great similarity with the factorial structures extracted in some previous studies (cf. Berlyne, 1971; Berlyne & Ogilvie, 1974; Cupchik, 1974; Tucker, 1955). The most commonly extracted factors can be classified into three groups: (1) Evaluation or Hedonic tone (containing attributes such as good-bad, pleasant-unpleasant), (2) Potency or Arousal (e.g. strong-weak, interesting-uninteresting), and (3) Activity or Uncertainty (e.g. active-passive, complex-simple). Osgood and his collaborators extracted similar factors in their studies of affective meaning (Osgood et al., 1957; Osgood et al., 1975).

PURPOSE OF THE STUDY

The present study had two purposes: (1) to specify the differences between the judgments of representational and abstract paintings, and (2) to specify their possible overlapping in some aspects of subjective experience. Thus, we wanted to find out what characterizes the subjective experience of abstract vs. representational art.

1. The basic dimensions of the reference frame for the subjective experience of paintings were sketched in the previous paragraphs. The main purpose of the present study was to investigate the differences between representational and abstract paintings in the judgments on the perceptual, semantic and affective dimensions. Abstraction and representation were defined by the reconizability of content: representational paintings were defined as paintings whose content represents recognizable objects, scenes and events, whereas, abstract paintings were defined as compositions of lines, shapes and colors (cf. Gooding, 2000; Moszynska, 1990; Perry, 2005). Having in mind that compared to abstract paintings, representational paintings are oriented towards the precise, detailed and regular depiction of physical 3-D scenes, we expected that they will have higher judgments on the perceptual dimensions of Form, Space and Complexity, higher judgments on the semantic dimension of the Illusion of Reality (the opposite pole of the Construction of Reality), and higher judgments on the affective dimension of Regularity. On the other hand, we expected that abstract paintings would have higher judgments on the perceptual dimension of Color, higher judgments on the semantic dimensions of the Construction of Reality (the opposite pole of the Illusion of Reality) and Expression, and higher judgments on the affective dimension of Arousal. This expectation was based on the fact that abstract paintings were created with the intention to construct the new non-figural reality in which the artist's feelings were expressed and the observer's attention was aroused using the composition of pure colored shapes (cf. Gooding, 2000; Moszynska, 1990; Perry, 2005).

One of the above-mentioned predictions should be additionally clarified. Namely, the expected difference between representational and abstract paintings on the dimension Illusion-Construction of Reality could be interpreted as a simple translation of the "objective" definition of two categories of paintings into the domain of subjective experience. For instance, one could expect that representational paintings would have a high judgment on the Illusion of Reality (scale: "The artist wanted to depict the exact appearance of the scene.") because they were *by definition* created to represent reality. Also, abstract paintings would have a high judgment on the Construction of Reality (scale: "The artist wanted to experiment with color and shapes.") because they were *by definition* created as compositions of shapes and colors. However, it is possible to imagine that some representational paintings, such as surrealistic or expressionistic artworks, have low judgments on the Illusion of Reality, that is high values on the Construction of Reality. This could be true even for extremely naturalistic visual artworks such as photography. For instance, unusual viewing angles and strange distributions of objects in a photographic scene could make an impression of complete abstraction.

2. As we have already mentioned in the introductory paragraphs, the distinction abstract-representational should not be regarded as dichotomous, but rather dimensional, so one could expect that some representational paintings had some abstract features, while abstract paintings had some representational

elements (see the definitions of abstraction and representation in the introduction). In order to specify the "clarity" of the categories of abstract and representational we used a discriminant analysis. This analysis should specify how well the sets of subjective variables (i.e. the perceptual, semantic and affective dimensions) predict the categorical classification of representational and abstract paintings.

EXPERIMENT

In this experiment two groups of participants judged the sets of representational and abstract paintings on the three groups of dimensions: perceptual dimensions (Form, Color, Space and Complexity), semantic dimensions (Illusion-Construction of Reality, Expression, Ideology and Decoration), and affective dimensions (Hedonic Tone, Arousal, Relaxation and Regularity).

Method

Participants: 60 undergraduate students of the Department of Psychology, University of Belgrade (38 female and 22 male; age range 19–22 years) participated in the experiment.

Stimuli: Two samples of paintings were used as stimuli, 18 representational and 18 abstract paintings.

In this study the representational paintings were defined as paintings whose content represents recognizable objects, scenes and events. Some of these contents can be depicted highly naturalistically, while some of them can be stylized or only sketched. Set of 18 representational paintings was directly taken from our previous study (Marković & Radonjić, 2008). This set encompasses the three categories of representational artworks: (1) ancient and non-Western art, (2) figural realism, and (3) stylized realism (see Appendix 1).

The abstract paintings were defined as paintings which do not, at first sight, depict any recognizable object, scene and event in the visible world. Stylized contents or paintings which suggest something recognizable were excluded from the category of abstract paintings. In the previous study (Marković & Radonjić, 2008) a base of 200 abstract paintings was created. For the purpose of the present study we asked ten participants to select 20 paintings in order to cover the widest possible spectrum of different styles. The participants were asked to remove the paintings which are not judged as completely abstract (e.g. paintings with highly stylized human faces). The participants performed the task individually. Eighteen most frequently selected paintings were selected as the stimulus set for the main study (see Appendix 2).

Instruments: The three instruments used in the experiment.

A. The *Perceptual dimensions of paintings* (Marković & Radonjić, 2008). Twelve bipolar 7-step scales distributed in four dimensions (three scales per dimension):

1. Form: imprecise – precise, messy – neat, undefined form – defined form;
2. Color: color gradient – color contrast, graduated lightness – lightness contrast, pastel colors – vivid colors;
3. Space: flat surfaces – voluminosity, no spatial depth – spatial depth, sharp contours – oval contours;

4. Complexity: multicolored – unicolored, ornate – plain, detailed – reduced.

B. The *Semantic dimensions of paintings* (Marković, 2006; Vasić & Marković, 2007). Eight unipolar scales distributed in four dimensions (two scales per dimension). The scales were sentences which described the intentions of the artist, i.e. what he or she wanted to depict (represent or express) in the painting.

1. Construction vs. Illusion of Reality (the bipolar dimension): The artist wanted to experiment with color and shapes (the indicator of the Construction of Reality).The artist wanted to depict the exact appearance of the scene (the indicator of the Illusion of Reality).
2. Expression: The artist wanted to express his/her emotions. The artist wanted to express his/her fantasies.
3. Ideology: The artist wanted to represent historical events. The artist wanted to transmit religious messages.
4. Decoration: The artist wanted to produce beautiful and nicely decorated objects. The artist wanted to induce pure aesthetic pleasure.

C. The *Affective dimensions of paintings* (Marković & Radonjić, 2008). Twelve bipolar 7-step scales distributed in four dimensions (three scales per dimension):

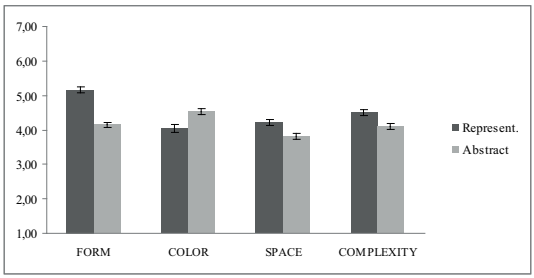
1. Hedonic Tone: ugly – beautiful, unpleasant – pleasant, sick – healthy;
2. Arousal: unimpressive – impressive, weak strong-, boring – interesting;
3. Relaxation: stressing – calming, cold – warm, gloomy – serene;
4. Regularity: chaotic – arranged, disharmonious – harmonious, irregular – regular.

Procedure: The paintings were presented to two groups of participants. Group 1 (N1=30) judged the representational paintings, whereas Group 2 (N2=30) judged the abstract paintings. The groups were balanced by an internal structure: they were composed by a random selection from a larger group of sixty undergraduate students. Having this in mind one should not expect that the group composition could be a relevant factor for the differences in the judgments. A between-subjects design was used in order to neutralize the successive contrast effect (cf. Elbert, Temme, & Gieszen, 1995; Specht, 2007). For instance, in Specht's (2007) study participants subsequently rated the same target artwork as being less *complex* and more *passive* when it was preceded by an abstract painting than when it was preceded by a representational painting. The groups were organized into four smaller subgroups consisting of 7 or 8 participants. Paintings were presented to each subgroup in a different random order. The stimuli were presented by an LCD projector on the screen. The stimuli were observed from the distance of 3–4 m and the dimensions of their screen projections were 1,5 x 1,5 m. The participants were asked to judge the stimuli on the three instruments (see previous section). The scales which belong to different dimensions were randomly ordered within the instruments. All participants completed the same standard forms of instruments, by marking the grade according to their impressions in what extent the particular attribute or statement was expressed. Within the instruments the scales were distributed in the following way: the first scale from the first factor, the first scale from the second factor, and so on, then the second scale from the first factor, the second scale from the second factor and so on.

They were told that in bipolar scales grade –3 indicates the least, and +3 the greatest intensity of attribute expression (in the cases of perceptual and affective dimensions), whereas in unipolar scales grade 1 indicates the least and 7 the gretaest agreement with the statement (in the case of semantic dimensions). The time for the judgment of each painting was not limited. When all participants judged the painting on all 36 scales, the slide with the next painting was presented.

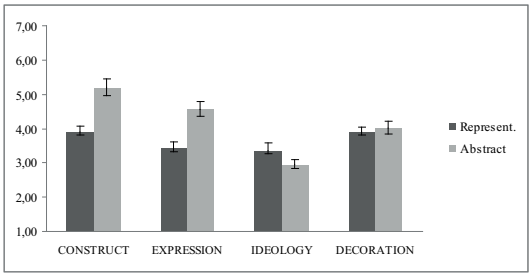
Results

The judgments were transformed from bipolar (–3 to 3) to unipolar values (1–7). Representational and abstract paintings were contrasted on the perceptual, semantic and affective dimensions. The average judgments of 18 representational and 18 abstract paintings on three sets of dimensions and the results of t-tests (representational vs. abstract) are shown in Figures 1–3.



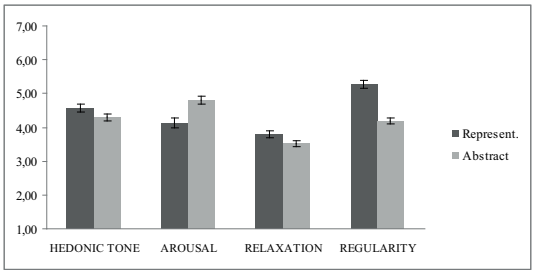
Perceptual dimensions		
	t	p
Form	3.28	.01
Color	–2.96	.01
Space	1.75	n.s.
Complexity	2.06	.05

Figure 1. Average judgments (M ± SE) of representational and abstract paintings on the Perceptual dimensions and results of t-tests (df=29).



Semantic dimension		
	t	p
Construction	–7.20	.01
Expression	–7.17	.01
Ideology	1.71	n.s.
Decoration	–1.27	n.s.

Figure 2. Average judgments (M ± SE) of representational and abstract paintings on the Semantic dimensions and results of t-tests (df=29).



Affective dimensions		
	t	p
Hedonic Tone	1.77	n.s.
Arousal	–3.78	.01
Relaxation	1.61	n.s.
Regularity	5.95	.01

Figure 3. Average judgments (M ± SE) of representational and abstract paintings on the Affective dimensions and results of t-tests (df=29).

These results confirmed most of our predictions. Namely, the representational paintings have higher judgments on the perceptual dimensions of Form and Complexity, the semantic dimension of the Illusion of Reality (opposite pole of the Construction of Reality), and the affective dimension of Regularity. These differences were expected because the representational paintings were made of relatively highly defined, precise, detailed and regular forms (see high judgments on Form, Complexity and Regularity) which can be easily associated with objects in the physical world (high judgments on the Illusion of Reality). The dominancy of the representational over abstract paintings in the case of the perceptual dimension of Space was missing. One possible reason for that is a relatively great number of 'flat' representational paintings such as ancient, non-Western and modern figural paintings.

In line with our predictions are the findings that abstract paintings have higher judgments on the perceptual dimension of Color, the semantic dimensions of the Construction of Reality (the opposite pole of the Illusion of Reality) and Expression, and the affective dimension of Arousal. This profile of judgments expresses the principal characteristics of abstract art. Namely, as it was emphasized in the introductory paragraphs of the paper, the abstract paintings were not created to represent anything from the physical world, but to construct a new iconic world (high judgments on the Construction of Reality) with an intention to express the artist's emotions and feelings and to induce similar mental states in the observer's mind (high judgments on Expression). Color plays one of the central roles among the artistic means (high judgments on Color) used in order to arouse and activate the observer's mind (high judgments on Arousal).

An interesting finding is that in spite of the expected higher judgments of abstract over representational paintings on the Construction of Reality, the value for representational paintings was not very low, but rather average: M = 3,90, that is close to the middle of the scale (the exact middle of a unipolar scale 1–7 value is 4, which is actually 0 on a bipolar scale –3 to 3). In other words, the judgments of representational paintings were distributed almost equally in both directions of the bipolar dimension of the Illusion-Construction of Reality. However, this was not the case for abstract paintings. They were judged consistently high on the Construction of Reality (M = 5,20).

Discriminant analyses

In addition to the direct comparison of representational and abstract paintings on single dimensions, the discriminant analysis was made in order to specify the classification power of three sets of dimensions.

A single discriminant function for all three sets of dimensions taken together (Perceptual, Semantic and Affective) was obtained. Standardized canonical coefficients and a structure matrix for the Affective dimensions of the Hedonic Tone, Arousal, Relaxation and Regularity are shown in Table 1. The canonical

correlation was significant: .840, $\chi^2(12) = 34{,}20$ p=.001. As the structure matrix has shown, the semantic dimensions of Construction and Expression had the highest indexes, and after them the affective dimensions of Regularity (negative value) and Arousal had high indexes. The discriminant function correctly classified all 18 abstract paintings (100%), and 16 of 18 representational paintings (88,9%). Two "primitive" representational paintings, the Jamaican cave painting (*Three turtles*) and the Mayan mural (*Jaguar*) were categorized as abstract, that is high on Construction and Expression. In order to obtain more precise information about the strength of the dimensions within their specific domains, an additional discrimininat analyses was made for the single sets of dimensions (Perceptual, Semantic and Affective).

Table 1: Results of the discriminant analysis for all twelve dimensions (four Perceptual, four Semantic and four Affective dimensions)

Standardized canonical discriminant function coefficient		Structure matrix	
Form	0.813	Construction	0.565
Color	0.415	Expression	0.516
Space	0.437	Regularity	–0.477
Complexity	–0.504	Arousal	0.303
Construction	0.781	Form	–0.299
Expression	0.025	Color	0.197
Ideology	0.185	Complexity	–0.152
Decoration	0.798	Hedonic Tone	–0.143
Hedonic Tone	0.368	Ideology	–0.138
Arousal	–1.597	Relaxation	–0.124
Relaxation	–0.025	Space	–0.120
Regularity	0.424	Decoration	0.075

a. A single discriminant function for the Perceptual dimensions was obtained. Standardized canonical coefficients and a Structure matrix for the Perceptual dimensions of Form, Color, Space and Complexity are shown in Table 2. The canonical correlation was marginally significant: .481, $\chi^2(4) = 8{,}41$, p=.078. The discriminant function correctly classified 13 out of 18 abstract paintings (72,2%). Five abstract paintings which belong to geometric abstraction and op-art (Delaunay, Larionov, Witt, Mondrian and Vasarely), were classified in a representational category, most probably because they were judged similarly to representational paintings, that is high on Form and Complexity and low on Color. In addition to this, the discriminant function correctly classified 13 out of 18 representational paintings (72,2%), but five of them (Standard of Ur, Jamaican cave painting, Braque, Macke and Dubuffet) were judged similarly to abstract paintings, that is as low on Form and Complexity and relatively high on Color.

Table 2: Results of the discriminant analysis for the Perceptual dimensions

Standardized canonical discriminant function coefficient		Structure matrix	
Form	.766	Form	.844
Color	–.485	Color	–.557
Space	–.138	Complexity	.430
Complexity	.303	Space	.338

b. A single discriminant function for the Semantic dimensions was obtained. Standardized canonical coefficients and a Structure matrix for the Semantic dimensions of Construction, Expression, Ideology and Decoration are shown in Table 3. The canonical correlation was significant: .730, $\chi^2(4) =$ 24,33, p=.000. The discriminant function correctly classified all 18 abstract paintings (100%) and 14 out of 18 representational paintings (77,8%). Four representational paintings (Jamaican cave painting, Lempicka, Lichtenstein and Dubuffet) were classified as abstract paintings most probably because they are objectively highly stylized and expressionistic and consequently judged similarly to abstract paintings, that is high on Expression and the Construction of Reality.

Table 3: Results of the discriminant analysis for the Semantic dimensions

Standardized canonical discriminant function coefficient		Structure matrix	
Construction	.815	Construction	.819
Expression	.354	Expression	.748
Ideology	–.150	Ideology	–.200
Decoration	.351	Decoration	.108

c. A single discriminant function for the Affective dimensions was obtained. Standardized canonical coefficients and a Structure matrix for the Affective dimensions of Hedonic Tone, Arousal, Relaxation and Regularity are shown in Table 4.

Table 4: Results of the discriminant analysis for the Affective dimensions

Standardized canonical discriminant function coefficient		Structure matrix	
Hedonic Tone	–.474	Regularity	.945
Arousal	–.082	Arousal	–.600
Relaxation	.158	Hedonic Tone	.283
Regularity	1.107	Relaxation	.246

The canonical correlation was significant: .615, $\chi 2(4) =$ 15,20 p=.004. The discriminant function correctly classified 11 out of 18 abstract paintings (61,1%). Seven abstract paintings which belong to the geometric abstraction and

op-art (Delaunay, Fontana, Hodgkin, Witt, Malevich, Mondrian and Vasarely) were judged similarly to the representational paintings, that is high on Regularity and low on Arousal. In addition, the discriminant function correctly classified 15 out of 18 representational paintings (83,3%), but three expressionistic and surrealistic representational paintings (Magritte, Macke and Dubuffet) were categorized as abstract, that is high on Arousal and low on Regularity.

DISCUSION

The subjective judgments of representational and abstract paintings were contrasted in this study. Representational paintings were defined as paintings which depict recognizable objects, scenes and events, whereas abstract paintings were defined as composition of lines, shapes, and colors (cf. Gooding, 2000; Moszynska, 1990; Perry, 2005). Generally, the results have shown that these two groups of paintings had distinct profiles of judgments on the perceptual, semantic and affective dimensions. Compared to abstract paintings, representational paintings had higher judgments on the dimensions of Form, Complexity, Regularity and the Illusion of Reality. The obtained profile was expected and in line with the definitions in which the representational paintings were defined as relatively precise, detailed and regular depictions of objects in the physical world (cf. Gooding, 2000; Moszynska, 1990; Perry, 2005). On the other hand, abstract paintings were not created to represent anything from the physical world, but to construct new iconic worlds and to express and induce emotions, feelings and other inner mental states; amongst the means which artists used in order to arouse and engage the observer's mind, color played one of the central roles (cf. Gooding, 2000; Moszynska, 1990; Perry, 2005). The results of the present study clearly corresponded to the mentioned characteristics of abstract paintings: compared to the representational paintings, the abstract paintings had higher judgments on the dimensions of Color, the Construction of Reality, Expression and Arousal.

While previous analyses have shown that the specified profiles consistently reflected the expected distinctive features of representational and abstract paintings, the results of the discriminant analyses revealed that some representational and abstract paintings did not "behave" typically for their categories. Namely, the predictions of the paintings belongingness to either the representational or abstract category have shown that some abstract paintings were categorized as representational paintings, and vice versa. This finding was very interesting because it indicated that the distinction between representational and abstract paintings was not sharply categorical, but rather dimensional. In the introductory paragraphs we had already questioned the categorical definitions of pictorial representation and abstraction. We stated that (a) some representational paintings could convey highly abstract and symbolic information and some

representational content could be recognizable, but shaped in more or less stylized forms (e.g. expressionism, cubism, surrealism, pop-art, etc), and (b) some abstract paintings, such as works of geometric abstraction, suprematism, abstract constructivism, op-art, and the like, could represent the regularities of natural world structures and patterns (cf. Arnheim, 1969; Gombrich, 1969). The results of the present study have shown that the representational paintings which were categorized as abstract came mainly from expressionism, surrealism, pop art and primitive paintings (e.g. Dubuffet, Macke, Braque, Magritte, Lichtenstein, Jamaican cave painting, etc.; see the Results section). Similarly to the abstract paintings, this subset of representational paintings was judged as high on the dimensions of Color, Expression, the Construction of Reality and Arousal, and low on Form, Complexity and Regularity. On the other hand, the abstract paintings which were categorized in the group of representational paintings came from geometric abstraction and op art (e.g. Delaunay, Witt, Mondrian, Vasarely, etc.). These paintings were similar to the paintings from the representational category due to the high judgments of Form, Complexity and Regularity, and the low judgments of Color and Arousal. One can speculate that this categorization is a result of the saliency of form in object representation: even when figures in abstract paintings are not associated with familiar objects, they can create an 'illusion' of objects if their form is regular and complex (e.g. Vasarely). On the other hand, colorful representational paintings with blurred contours and distorted forms (e.g. Macke) are experienced rather as consequences of subjective freedom and emotional expression (i.e. similar to abstract paintings), than the illusions of external reality.

The findings of present study revealed that the subjective categorization of paintings was generally based on the recognizability of the pictorial content: distinct profiles of judgments were found for representational and abstract paintings. However, the results suggested that the categorization was based on the formal or stylistic properties of the paintings, as well. In the obtained categorization we can recognize the formal or stylistic distinction of paintings along to one bipolar dimension. One pole of this dimensions could be characterized as a so-called linear style (cf. Wölfflin, 1915/1950), that is a style with a salient form, precisely arranged details and a regular composition, and which is recognizable in conceptualistic or classicistic art. The opposite pole could be specified as a so-called painterly style (cf. Wölfflin, 1915/1950), that is a style of free strokes, a dynamical use of colors and lines, which is incorporated in expressionistic, romantic and action art. In terms of Kubovy's concept of pleasures of the mind (Kubovy, 1999), the linear-classicistic pole could be associated with the pleasures of virtuosity and perfection, and admiration to highly articulated and sophisticated pieces of art (e.g. Renaissance, Classicism, etc). On the other hand, the painterly-expressionistic pole is close to the pleasures of curiosity and arousal, and the admiration to unusual and provocative artworks

(e.g. Expressionism, Surrealism, etc; for the role of arousal and fascination in aesthetic experience see more in Berlyne, 1971, 1974; Marković, 2010).

Further studies should directly and more systematically investigate the subjective (mental) significance of the two large categories of paintings (linear and painterly). Specifically, these studies have to provide a better insight into the relationship between objective pictorial features and a wide spectrum of aesthetic responses, such as aesthetic fascination, the judgment of beauty, the feeling of pleasure, the appraisal of deep layers of artwork narratives and discourses, and so on. In addition, having in mind that expertise and training in art could be crucial for the appraisal of the deeper layers of artistic narratives (especially in abstract art), further studies should more precisely investigate the effects of prior knowledge on the impression of abstraction and representation. Finally, it would be interesting to investigate whether the non-categorical nature of the mental classification of abstract and representational art could determine the participant's responses in more restricted experimental conditions, such as a categorization task (e.g. a two-alternative forced choice task). According to the results of the discriminant analysis, one could expect that RT and the number of errors would be greater for the paintings which were classified in "opposite" clusters (e.g. it would be more difficult to categorize Dubuffet as a representational painting than Constable).

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APPENDIX 1

The sample of 18 representational paintings used as stimuli in the experiment. Paintings were categorized into three categories.

Ancient and non-Western art:

1. Theophanes the Greek – *The Don Virgin*
2. Mayan mural – *Jaguar*
3. Mesopotamian art – *Standard of Ur (detail)*
4. Kitao Shigemasa – *Beauties of the East*
5. Jamaican cave art, Potoo Hole – *Aaraw ("Three turtles")*
6. British art (manuscript illumination) – *Sir Tristan Fighting in a Mêlee*

Figural realism:

7. John Everett Millais – *The Bridesmaid*
8. John Constable – *Arundel Mill and Castle*
9. Jacques-Louis David – *The Sabine Women Enforcing Peace by Running Between the Combattants*
10. Gustave Caillebottes – *Paris Street, Rainy Weather*
11. Vermeer van Delft – *The Music Lesson*
12. Francisco de Zurbarán – *Still Life with Pottery Jars*

Stylized realism:

13. Georges Braque – *Black Fish*
14. Rene Magritte – *The Blank Check*
15. Auguste Macke – *Lady in a Green Jacket*
16. Tamara de Lempicka – *Adam and Eve*
17. Roy Lichtenstein – *In the Car*
18. Jean Dubuffet – *Dhôtel in Shades of Apricot*

APPENDIX 2

The sample of 18 abstract paintings used as stimuli in the experiment.

1. Josef Albers – *Black and white composition*
2. Robert Delaunay – *Rhythms*
3. Lucio Fontana – *Spatial Concept*
4. Francis Picabia – *Udnie*
5. Jay Hall – *Juice*
6. Hans Hartung – *Angers*
7. Howard Hodgkin – *Mr & Mrs E.J.P.*
8. Wassily Kandinsky – *Composition VI*
9. Franz Kline – *Painting No. 2*

10. Franck Kupka – *Organization of Graphic Motifs II*
11. Mikhail Larionov – *Blue Rayonism*
12. Sol le Witt – *Loops & Curves Gray*
13. Kazimir Malevich – *Aeroplane Flying*
14. Mark Rothko – *Blue and grey*
15. Piet Mondrian – *Composition with Red, Yellow and Blue*
16. Victor Vasarely – *Delocta*
17. Jackson Pollock – *Convergence*
18. Windsor Utley – *Lake Union*