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THE PHYSIOLOGY OF PHENOMENOLOGY: THE EFFECTS OF ARTWORKS*

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ABSTRACT

In a five-year long research project "eMotion—mapping museum experience," we assessed which effects artworks had on museum visitors and their behavior in the field. We tested several hypotheses such as: Does a famous work attract more attention than a less renowned one, and a "loud" artwork more than a subtle one? Do similar artworks generate similar visitor reactions? Does an artwork lose its attraction if manipulated? To investigate these questions, experiments were conducted using special technology that allowed tracking of visitors' physical locomotion and continuous measurement of physiological markers in the gallery. We also recorded visitors' general subjective assessments of their museum experience, and with respect to specific artworks. Using this innovative approach, we were able to demonstrate strong correlations between artworks, the physical reactions of the visitors, their spatial behavior, and aesthetic ratings.

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Analytical, semiotic, phenomenological, and many other theoretical perspectives have been applied to analyze or describe artworks and their effects on the beholder in the philosophy of art. Compared to this large body of theoretical discourse, which had its starting point roughly 2,500 years ago, relatively little empirical research has followed suit.[1] The empirical research has investigated top-down patterns of artworks (Arnheim, 1954), and has implemented bottom-up, behaviorist frameworks (Berlyne, 1960; Krupinski & Locher, 1988), or cognitive-appraisal frameworks (Silvia, 2005). Research using neurobiological measures has complemented empirical aesthetics in recent decades (Jacobsen, Schubotz, Höfel, & v. Cramon, 2006; Kawabata & Zeki, 2004; Kuchinke, Trapp, Jacobs, & Leder, 2009; Sargent-Pollock & Konecni, 1977). In one of the latest readers entitled "Neuroaesthetics" (Skov & Vartanian, 2009), empirical aesthetics was discussed under a variety of perspectives as bio aesthetics, evolutionary aesthetics, aesthetic appreciation as well as from the perspective of different art genres such as film, visual art and literature. This gives a multifaceted insight into the state of art in the field of empirical aesthetics, showing that aesthetics is not only understood as "art" and that the term "neuro" functions as an umbrella term which embraces diverse understandings of empirical aesthetics. On the following pages, we will focus on visual arts and its effects on the beholder.

If one has a closer look at psychological aesthetics research in the field of visual arts, it is surprising to see that it is almost exclusively laboratory research. Since Bruno Latour's analysis of the "Social construction of scientific facts" in laboratories in 1979, scientists have become increasingly more aware of how specific laboratorial settings and methods create specific data and interpretations. If it comes to art, the validity of such research is limited. The originality and authenticity of an artwork, its material properties and spatial arrangement are not represented in the usual screen displays of the lab (Bordens, 2010; Hagtvedt, Hagtvedt, & Patrick, 2008; Martindale, Moore, & Anderson, 2005; Polzella, Hammar, & Hinkle, 2005; Silvia, 2005). Commenting on this development, Martindale (2007) noted that "In their desire to make psychology a rigorous science, psychologists confused experimentation with empiricism and fled into their laboratories" (p. 123).

This may partly explain the small impact of empirical aesthetics on art theory in the humanities. Art theorists and artists commonly ignore the "scientific" approach and its results, because it has almost nothing to do with their own work. A rather "anti-empirical" attitude has developed, as one can see in Adorno's bon mot "I do not believe in counting peas."[2] Behaviorism as well as "laboratorism"

[1] For an overview in the development of empirical aesthetics, see e.g., Martindale (2007) and Allesch (2006).

[2] It has been and still is critically discussed, if art or its effects should be measured, which can also be seen in the media reaction to the project *eMotion.* For a critical media analysis, see Tröndle, M. and van den Berg, K. *Die Logik der Kunstkommunikation* (in preparation).

must be overcome for empirical aesthetics to have any real impact on art discourse. Artworks must be viewed as originals and in their architectural and curatorial context. Curators are very deliberate and careful in their decisions on where to hang which artwork, or on the design of the interior of gallery spaces. Therefore the study of art reception must be put in the context of other artworks and of the physical environment. Ecological psychology has focused on such "standing patterns of behavior" (Barker, 1978); they are "afforded" by the environment. These patterns become apparent when the locomotion of visitors through a steady museum environment is being visualized. Research in the field of empirical aesthetics must consider such environmental circumstances (see Houtven & de Geus, 2009).

However, to our knowledge, empirical research on the effects of artworks on the beholder has almost never been carried out in the field of the fine art museum. In museum studies one hardly finds any visitor literature that focuses on the visitor. In the two most recent English-language readers (Carbonell, 2007; McDonald, 2006), only two out of 86 texts discussed visitor issues. In the latest German-language readers (Baur, 2010; Kittlausz & Pauleit, 2006), one finds a similar absence of visitor-oriented empirical research. There seems to be a strong separation between museum studies, which are empirically oriented, and theoretically based art literature, which mirrors the segmentation between empirical and philosophical aesthetics.

On the other side, empirical visitor studies indeed have a long tradition (Yalowitz & Bronnenkant, 2009). Edward Stevens Robinson introduced early forms of visitor tracking in the 1920s. Nowadays, the fashionable keywords are "Visitor-Studies" and "Audience Development," where mostly demographic data and expectations of visitors are analyzed (Kirchberg, 2010; Reussner, 2010; Schäfer, 2004; Waidacher, 1999), but hardly ever the effect of artworks on the visitors is studied. Even under the term "Museumspsychologie" ["Museum Psychology"], one will not find research which goes further than the standard questionnaires and descriptive analyses (Schuster & Ameln-Haffke, 2006). One of the leading experts in the field of museum visitor experience, John Falk, strongly criticizes this kind of limited perspective.[3]

With the Swiss National Research project "eMotion—mapping museum experience," we tried to enlarge the perspective on museum visitor experience. In this context, we developed new research methods using exact position location, physiological measurements and several questionnaires, to validate the quantitative data qualitatively; to do empirical research in the aesthetic

[3] "Demographic descriptions of museum visitors do sometimes reveal interesting patterns, but interesting patterns are not the same as useful patterns. Quantitative measures such as demographics provide too little information about visitors in relation to museums to be useful variables for describing and understanding the museum visitor experience" (Falk, 2009, p. 32).

field of a museum.[4] Technical developments have only recently made it possible to monitor an individual's locomotion and physiology in the "psychogeography" of a fine art museum. Here, we will try to establish a physiological phenomenology.

PHYSIOLOGY AND PHENOMENOLOGY

Aesthetic experience has been discussed as "sensual knowledge" (Baumgarten, 1758) or as "embodied phenomenology" (Merleau-Ponty, 1966), or along the lines of the concept of the "Aisthetik" ["Aisthetics"] (Böhme, 2001). Neither of these concepts could broadly establish itself in the art theory discourse where, following the Cartesian tradition, art experience is mainly understood as an intellectual process, viewing cognition and body as two separate entities (Allesch, 2006). With newer concepts of neuroscience (Ciompi, 1997; Gallagher, 2005; Maturana & Varela, 1980), sensory experience and perception are understood as embodied processes (Tschacher & Tröndle, 2011): There is no perception without a perceiving body. Likewise, all forms of cognition (e.g., memory, appraisal, categorizing) are conceived as embodied cognition. This is the combined result of interactions between different fields of research in psychology and cognitive science (Tschacher & Bergomi, 2011). The consequences for research on aesthetics are twofold. First, we are offered new levels of observation that become relevant for the reception of artworks, such as bodily movement and locomotion. Second, the "classical" intellectual process of valuing art is now complemented by emotional processes. Emotion has a marked bodily component, which can be measured through peripheral physiological signals. Both aspects of embodiment, motor action and physiology, must be viewed as associated with the intellectual cognitive processes in a circular, reciprocal fashion: the body influences the mind and vice versa. The result of such recursive processes is the essence of embodied cognition. In the psychogeographical mappings of the present article, we will visualize such processes.

The Enjoyment of Art or the Art Itself?

Referring to the paradigmatic shift which occurred in other disciplines such as the literature studies, Kemp (1992) stated that art historians and art theorists did not even recognize the role of the recipient, which he calls "Rezeptionsästhetik" ["Reception Aesthetics"] (p. 7f.). Kemp refers to the concept of the Renaissance thinker Gabriele Paleotti (1582) who wrote that "the effect on a beholder of a painting must be conceptualized in the process of painting" (p. 9). At that time, when the arts were becoming increasingly independent from producing religious or courtly illustrations, this effect-orientated theory was harshly criticized. In

[4] For more information, see www.mapping-museum-experience.com/en

1785, Karl Philipp Moritz claimed that art should not try to have an effect on the beholder but only follow its inherent logic ("innere Zweckmäßigkeit" statt "äußerem Zweck," "inner expediency" instead of "external purpose") (Kemp, 1992, p. 12). In the following nearly 150 years, from Immanuel Kant to Martin Heidegger, a work-centered perspective dominated art theory. Put into a strict subject-object opposition, the German painter Philipp Otto Runge asked in 1803: "What is it what I want? The enjoyment of art or the art itself?"[5] This very brief historical line shows the development of a more and more intellectualized understanding of fine art.

One could read Umberto Eco's concept of the "The open work" (1962) as a re-actualization of the idea of "Rezeptionsästhetik" ["Reception Aesthetics"]. The recipient is now playing a central role in the production of the artwork, the process of reception—not the artwork—is the starting point of his philosophy. Interestingly, the recipient has become more and more important in art theory during the last 40 years, but only in a de-bodied, mostly sociological or critical conception (e.g., in the works of Pierre Bourdieu or Niklas Luhmann). For the most part, the experience of art has up until now been separated from the body.

An embodied approach need not fall back on reductionist, object oriented models of perception, such as Gestaltbildung (e.g., Arnheim, 1954), information theoretical models (Kobbert, 1986), or stimulus-response models (e.g., Berlyne, 1960). We will proceed by measuring embodied effects, including objective physiological variables, yet will still incorporate aesthetic experience as a complex process. Working on the encompassing dataset that was generated in the eMotion research project, we became increasingly aware of art reception as a complex interplay of specific qualities of an art object, its curatorial surroundings and spatial arrangement, and the expectations of the recipient.[6]

METHOD

Materials and Procedure

In the context of the empirical project "eMotion—mapping museum experience" we could turn one section of the Kunstmuseum St. Gallen (Switzerland) into a large "laboratory" for several months in the year 2009 (see Figure 1). Using wireless data acquisition systems, visitors' physical positions and physiological parameters were recorded.

[5] The original quote is: "Und überhaupt, ist es denn wohl eigentlich der Kunstgenuβ, den ich will, oder ist es die Kunst, wo ich hinauswill? [...]" Runge, Philipp O.: Hinterlassene Schriften, hrsg. v. D. Runge, Hamburg 1840, Bd. 1, S. 236. As cited in Kemp (1992, p. 14).

[6] See Tröndle, M., Wintzerith, S., Kirchberg, V., van den Berg, K., & Tschacher, W. *Is this Art?: A field study on the decision art/non-art of visitors to a fine art museum* (forthcoming).

Figure 1. The classicistic building of the Kunstmuseum St. Gallen (Museum of Fine Arts) in the city park.

In this section (see Figure 2) of the museum, visitors saw the exhibition "11 : 1 (+3) = Eleven Collections for a Museum," which was curated particularly for this study. It consisted of 76 works of modern and contemporary paintings, drawings and a few sculptures. Around 70 were displayed in the different "situations" (0-3). In each situation different experiments were conducted, such as rehanging, exchanging or removing artworks to test different hypotheses. The artworks came from e.g., Claude Monet, Max Liebermann and Edvard Munch, Ferdinand Hodler, Max Ernst, Fernand Léger, Le Corbusier, Andy Warhol and Roy Lichtenstein, Imi Knoebel, On Kawara, and others.

Entering the Museum, visitors were asked to participate in our study ($N = 576$, including a control group). Five hundred thirty-two visitors, who took part in the project, received an electronic glove at the exhibition entrance that included measurement sensors and a sender, which transmitted data to wireless receivers in all spaces. From these positioning data, we could infer movement speed and time spent in front of a specific picture or object. In addition, two physiological parameters, heart rate (HR) and skin conductance level (SC), with their respective variabilities, heart rate variability (HRV) and skin conductance variability (SCV), were monitored, transmitted and stored on a second-by-second basis. Measurements were obtained continuously throughout each participant's visit of the exhibition. The duration of visits were uninhibited, so that the viewers were completely unrestricted in their choice of artworks to be viewed.[7] We also developed new forms of displaying this information, for example information cartography, to reach a better understanding of art reception in a museum.

[7] For a more detailed technical description, see Tröndle, M., Kirchberg, V., & Tschacher, W., *An integrative and comprehensive methodology for studying aesthetic experience in the field* (forthcoming).

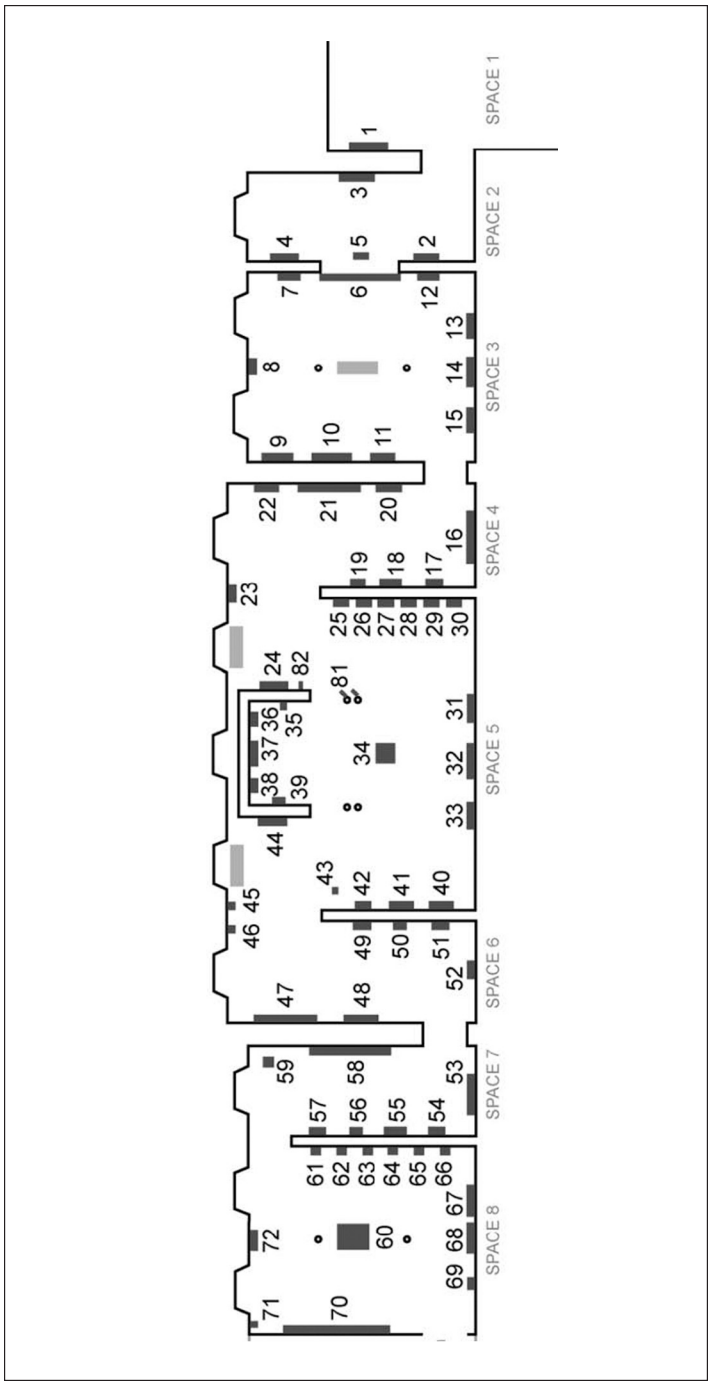

Figure 2. Floorplan of the ground floor of the Kunstmuseum St. Gallen with the exhibition Spaces (2-8), the entrance and exit.
Notes: Black lines represent the walls of the exhibition space and eight columns. The pictures on the walls are depicted as rectangles, the sculptures as squares. The black numbers indicate the locations of artworks (Place ID). The three light grey rectangles represent benches.

Together with the electronic glove, the visitor also received an individual "subject ID." After attaching the glove, a project assistant conducted an interview with the visitor about his or her expectations for the exhibition and demographic information. The answers to this so-called "entrance survey" were immediately entered in the electronic database created for each visitor and identifiable by the subject ID. After the visit of the exhibition, a project assistant removed the glove and helped the visitor fill out another standardized interview that focused on the exhibition just experienced. In the interdisciplinary context of the project, the geo-physiological dataset was joined with the sociological entrance survey and the psychological exit survey.

This exit survey repeated some of the questions of the entrance survey to compare pre-visit expectations and post-visit experiences with respect to dimensions of the exhibition experience. In addition, the exit survey prompted several selected works of the exhibition to sample detailed assessments of these works. Each visitor filled out questionnaire items about so-called "index works" (artworks in the show which were likely to be viewed by all visitors) and "maxi works," artworks for which we measured maximum values of time spent in front of the work or maximum shifts in HR and SCL.

RESULTS

Reliability

The possibility that the set of technical measuring tools (from wearing gloves to having to undergo extensive surveys) might distort the experience of the exhibition and, as a consequence, the study results (Babbie, 2004), is an important critical aspect of the eMotion study. Therefore, a control group ($N = 24$, i.e., 4,3% of the surveyed participants) of randomly selected visitors was prompted to visit the exhibition without a measuring glove. In this group the same entry and exit surveys were carried out as with the visitors who wore a measuring glove ($N = 532$, 95,7%). To determine whether the responses of participants with gloves and without gloves were significantly different, differences between the two groups were checked based on several questionnaire features. The participation in the eMotion study was found not to interfere with the exhibition experience. In fact, it was significantly perceived as positively inspiring for the individual exhibition visit. Almost 94% of the interviewed visitors considered the survey to be "interesting" (ANOVA: F-value (analoguous to t-value) = 11.814, $p < .0001$). The eMotion survey also influenced the individual perception of art positively (F-value = 7.054, $p < .001$). Due to the other significance tests, it may be assumed that wearing a glove did not influence almost all questions.

Principal Component Analysis (PCA) of Aesthetic Assessments

The ratings given at the exit survey addressed specific emotional and aesthetic effects of the exhibited artworks. We summarized these different effects by the factors obtained through PCA of all nineteen items (5-point Likert scales) of the questionnaire integrated into the exit survey. Items covered emotions evoked by an artwork (e.g., joyful, sad, angry, frightening, surprising), aesthetic evaluations of an artwork (e.g., beautiful, touching, artistically well done, eminent) and the viewer's general appraisal of an artwork (e.g., dominant, activating, positive, appropriately hung, suitable for gallery context, renowned artist).

The factor structure of PCA was established in a larger dataset of 3,555 single records of questionnaire assessments of artworks. 934 of these records originated from a pilot study in which the artworks of the same exhibition were rated. The Kaiser criterion (eigenvalues > 1) suggested extracting five factors, which accounted for 69.2% of total variance of the 19 items. We performed Varimax rotation to determine uncorrelated factors. The factor scores were consequently used as descriptors of the aesthetic-emotional assessments of an artwork (Table 1):

1. "Aesthetic Quality" (the work is rated as pleasing; beautiful; emotionally moving; well done with respect to technique, composition, and content; estimated artist; important in art history);
2. "Surprise/Humor" (the work is considered as surprising; makes one laugh; partially, makes one think);
3. "Negative Emotion" (the work conveys sadness; fear; anger);
4. "Dominance" (the work is experienced as dominant; stimulating); and
5. "Curative Quality" (the work is staged and presented well; is connected to other artworks).

Each participant's aesthetic and emotional preference of an artwork was hence given by the respective factor scores. These five factors show how the participants rated the individual items of the works after their experience in the exhibition hall.

Interestingly, the visitors did not differentiate between art-theoretically different items, such as "art-historical importance" and "importance of the artist" (which may be seen as a contextual factor), neither between items which solely qualified the work as well done with respect to technique, composition, and content, or personal judgments such as pleasing, beautiful, and emotionally moving. According to the factor analysis, museum visitors appeared to experience all these items as one cluster, which we labeled "Aesthetic Quality."

Processing of Physiological Measurements

The continuous monitoring of HR and SCL (heart rate and skin conductance) were averaged over the complete duration of time that any visitor spent inside the region of interest of each artwork in the exhibition. The time spent inside a region

Table 1. Rotated Factor Pattern of Aesthetic Assessments

	Factors				
	Aesthetic Quality	Surprise/Humor	Negative Emotion	Dominance	Curative Quality
Stimulating	0.05	0.30	0.00	**0.79**	0.08
Dominant	0.26	0.04	0.11	**0.83**	0.03
Content good	**0.74**	0.21	0.01	0.11	0.22
Technique good	**0.82**	0.01	–0.06	0.10	0.12
Composition good	**0.78**	0.18	–0.05	0.11	0.20
Beauty	**0.85**	0.19	–0.13	0.05	0.05
Artist good	**0.80**	–0.09	–0.05	0.07	0.21
Important in art history	**0.79**	–0.14	0.01	0.07	0.21
Presentation good	0.20	0.13	–0.05	0.12	**0.79**
Pleased me	**0.76**	0.40	–0.13	0.11	0.04
Made me laugh	–0.05	**0.79**	–0.13	0.02	0.15
Surprised me	0.18	**0.73**	0.11	0.26	0.06
Made me think	0.42	**0.51**	0.26	0.20	0.11
Emotionally moving	**0.66**	0.40	0.22	0.14	0.03
Frightened me	–0.04	0.00	**0.84**	0.13	–0.03
Made me angry	–0.39	–0.03	**0.64**	0.08	0.05
Made me happy	**0.59**	0.53	–0.17	0.08	0.05
Made me sad	0.10	0.03	**0.84**	–0.08	–0.09
Connection to other artworks	0.33	0.13	–0.03	–0.02	**0.77**

was considered a "visit" of the corresponding artwork if it extended over three seconds or more. Thus, we obtained the mean level of HR and SCL by visitor and by artwork. If a visitor had repeated visits to the same artwork, these were also averaged across visits. The standard deviations of HR and SCL during the time of visit(s) were used as the variables heart rate variability (HRV) and skin conductance variability (SCV).

We applied the aesthetic-emotional assessments (five factors) and the physiological measures (four variables) to the following five artworks: Claude Monet's "Palazzo Contarini, Venedig" ["Palazzo Contarini, Venice"] (1908) (see Figure 4); Ferdinand Hodler's "Linienherrlichkeit, III. Fassung" ["Line Magnificence"] (around 1909); Hans Arp "Entre Lys et Défense" (1958) (see Figure 5); Günther Uecker's "Antibild, Räumliche Struktur, Aggressive Reihung" ["Antipicture, spatial structure, aggressive sequence"] (1974) (see Figure 3); and Andy Warhol's "Campbell's Condensed Tomato Soup" (1962).[8] These works received the highest numbers of assessments in the exit survey (range 105–232) and are therefore presented here.

We computed a hierarchical mixed effects model for each dependent variable using "subject ID" as a random effect and "artwork" as the fixed effect (Table 2). These models were based on 764 single assessments of the independent variable (artwork), with its five levels. Dependent variables were the five

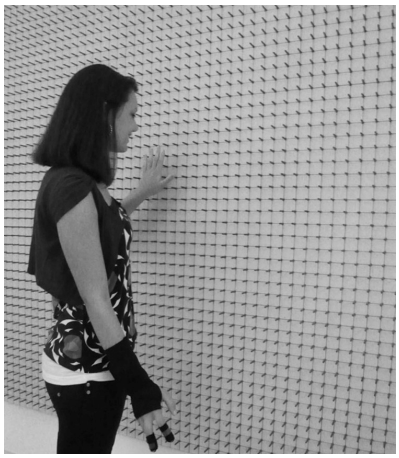

Figure 3. Visitor with electronic glove in front of Günther Uecker "Antibild, Räumliche Struktur, Aggressive Reihung, 1974."

[8] You will find the pictures of the discussed artworks here: http://www.kunstmuseumsg.ch/pressebilder/index.php?anlass=elfsammlungen_bida

Figure 4. Claude Monet, Palazzo Contarini, Venedig, 1908.

Figure 5. Hans Arp, Entre Lys et défense, 1958.

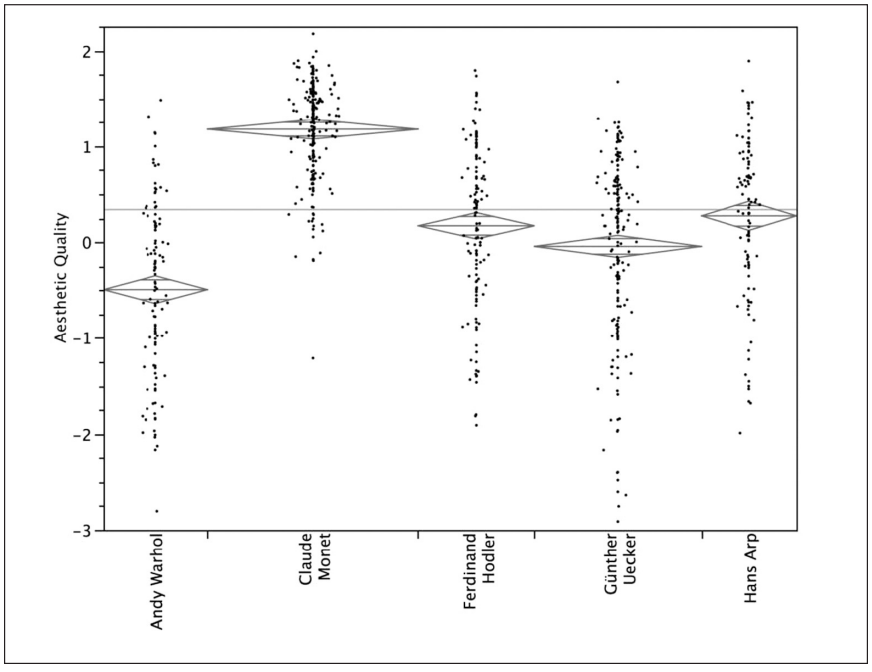

Figure 6. Ratings of Aesthetic Quality of the works. The black dots indicate the exact ratings per participant for the respective artwork. The center of the rhomb indicates the average of these ratings. The height of the rhomb indicates its standard deviation, rhomb width the number of ratings.

Table 2. Mixed Effects Models of the Associations of Five Selected Artworks with Aesthetic-Emotional Assessments and Physiological Measures

Dependent variable	Fixed effect "artwork": *F*-test, explained variance	Random effect "subjectID": variance component	Monet	Hodler	Arp[a]	Uecker	Warhol
Aesthetic Quality	120.3****, 37.7%	13.6%	+****			–****	–****
Surprise/Humor	71.0****, 28.9%	27.3%	–****	–****			+****
Negative Emotion	20.3****, 18.0%	19.2%			–	+****	–**
Dominance	37.9****, 22.3%	18.6%	–****			+****	–***
Curative Quality	4.3**, 16.0%	32.3%	–**	+*			+*
Heart rate level	1.6 ns, 14.7%	58.6%					
Heart rate variability	34.6****, 22.5%	26.7%		–*	–	+****	–***
Skin conductance level	8.0****, 2%	95.5%	–**	–****			+*
Skin conductance variability	11.4****, 18%	34.2%		–**		+****	

[a]These values were estimated on the basis of fixed effects regression.
Note: + Larger than average; – smaller than average.
*$p < .05$; **$p < .01$; ***$p < .001$; ****$p < .0001$.

aesthetic-emotional factors and the four physiological variables. We found that the five artworks were significantly different in all aesthetic-emotional assessments. "Aesthetic Quality" had the highest explanatory value, with Monet's "Palazzo Contarini" receiving high ratings and Uecker's "Antibild" and Warhol's "Campbell's Tomato Soup" receiving low ratings (Figure 6). The physiological measures, except HR, also differed significantly between these exemplary artworks. HRV was the physiological measure that explained the most variance; Uecker's work "Antibild" showed the highest expression of HRV in its viewers, whereas Warhol's "Campbell's Tomato Soup" was associated with the lowest values of HRV.

Table 2 indicates that the variances explained by the model vary considerably. SCL, for instance, depends almost exclusively (95.5%) on properties of the subject, only 2% of the total variance is accounted for by the artworks. HRV, on the other hand, is an appropriate indicator for evaluative purposes, because 22.5% of its variance provides information on art-related responses.

The participants rated the Aesthetic Quality of Monet's work significantly high (Figure 2). Yet, they did not consider this work as strong or stimulating; neither were they surprised by it. On the contrary, Uecker's "Antibild" was evaluated as a dominant work, which causes strong negative emotions with its Aesthetic Quality rated significantly negative. Interestingly, Warhol's "Campbell's Tomato Soup" received the lowest rank on the factor Aesthetic Quality. One may argue that the Aesthetic Quality of art has become less and less important in the 20th century, whereas factors like "Surprise" or "Dominance" become increasingly important. One has to consider, however, that Aesthetic Quality is a complex factor of different items, which are not reducible to "beauty" alone (Table 1).

The Effects of Media

Similar procedures were used to estimate the aesthetic-emotional effects of various groupings of artworks. These groupings were derived from art theory and curatorial experience. The first such grouping was "Media": we clustered all assessed artworks into the categories "painting," "drawing," "sculptural paintings," and "sculptures." Again, hierarchically mixed models were computed in each aesthetic-emotional factor, this time using "subject ID" and "artwork" as random effects, because each media category contained multiple assessments of the identical artworks as well as multiple assessments by identical visitors. "Media" was estimated as the fixed effect (Table 3). Figure 7 shows the means of Aesthetic Quality for the four media we distinguished: paintings were assessed as having the highest Aesthetic Quality, sculptures and sculptural paintings had the lowest ratings.

It is important to note that in these categories we joined works of different decades, artists and styles. In the category "painting," for example, works by

Table 3. Mixed Effects Models of the Associations of Media Categories with Aesthetic-Emotional Assessments

Dependent variable	Fixed effect "Media": *F*-test, explained variance	Random effect "artwork": variance component	Random effect "subjectID": variance component	Painting	Drawing	Sculpture	Sculptural painting[a]
Aesthetic Quality	7.1***, 19%	11.5%	14.3%	+***		–*	–
Surprise/Humor	4.2*, 11.8%	7.7%	21.8%	–*		+*	+
Negative Emotion	1.3 ns, 14.4%	8.1%	17.4%				+
Dominance	5.2**, 12.7%	9.6%	12.3%		–***		+
Curative Quality	1.9 ns, 10.2%	9.4%	27.8%		+*		

[a]These values were estimated on the basis of fixed effects regression.
Note: + Larger than average; – smaller than average.
*$p < .05$; **$p < .01$; ***$p < .001$; ****$p < .0001$.

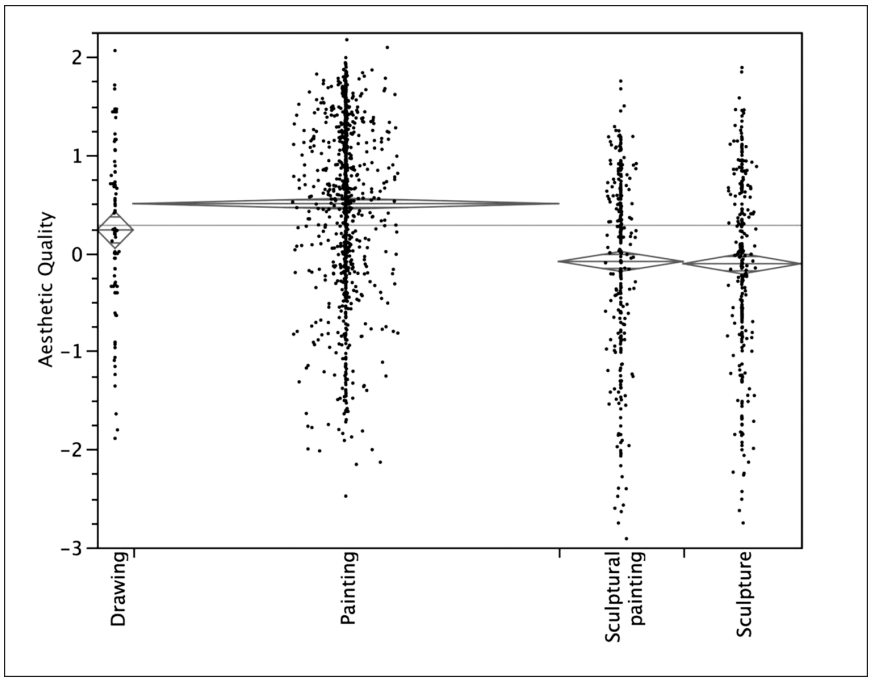

Figure 7. Ratings of "Aesthetic Quality" of the four different media. The black dots indicate the ratings per participant for the respective media category.

Claude Monet, Augusto Giacometti, Walter Kurt Wiemken, Hans Krüsi, Peter Phillips, Max Bill, and Franz Wanner were joined. Independent of the varying styles of painting, the medium "painting" clearly dominated the ranking. Apparently, sculptures (Hans Arp, Thomas Virnich, or Dieter Roth) as well as "sculptural paintings" (Günther Uecker, Roy Lichtenstein, James Rosenquist, Madeleine Kemeny-Szemere, Lucio Fontana) reached the same (negative) estimations in the category "Aesthetic Quality."

The Effects of Style

The second grouping of artworks was "Styles": we clustered the 76 assessed artworks into the following categories: (a) Figurative/Pictorial (e.g., Ferdinand Hodler, Giovanni Giacometti); (b) Modernist/Constructionist (e.g., Oskar Schlemmer, Fernand Léger); (c) Modernist/Surreal (e.g., Walter Kurt Wiemken, Max Ernst); (d) Amorphous/Organic (e.g., Julius Bissier, Hans Arp); (e) Constructivist (e.g., Henryk Stazewski, Georges Vantongerloo); (f) Formal (e.g., Max Bill,

Josef Albers); (g) Conceptual (e.g., On Kawara, Imi Knoebel); (h) Abstract/ Material-specific (e.g., Günther Uecker, Yves Klein, Lucio Fontana); (i) Pop-Art (e.g., James Rosenquist, Roy Lichtenstein, Andy Warhol, Dieter Roth); (j) Intervention/Performative (Nedko Solakov). The largest differences across clusters were found in the factor "Surprise/Humor" (Table 4, Figure 8):

The pop artists received high ratings in the category "Surprise/Humor," only being excelled by the work "A lable level" by Nedko Solakov. "A lable level" was a humorous work, consisting of more than 30 black felt pen scribblings. Solakov commented on other artworks in the exhibition and on the exhibition setting itself. The high ranking of pop artists in section (i) is reasonable considering that several of these works in the exhibition were indeed funny, as for example Dieter Roth's "Doppelzwerg," two garden gnomes embedded in chocolate, or James Rosenquist's "Bild mit Glühlämpchen" (Photo 10). The ranking appears to make sense, but obviously one cannot generalize on the basis of just one work, that (j) Intervention/Performance is per se humorous.

The Effects of Architecture/Age

The third grouping of artworks was according to the architecture of the exhibition: we clustered the 76 assessed artworks into the categories Space 2 through Space 8 depending on the museum hall in which the artwork was located (see Figure 2). The results of mixed-models regression are given in Table 5. The largest differences across clusters were found in the factor "Aesthetic Quality" (Figure 9a).

The exhibition "11 : 1 (+3) = Eleven Collections for a Museum" did not just present eleven collections donated to the museum and the story of these collectors. It also presented a loose art historic tour through the art history of the 20th century. It started in Space 2, with works created between 1902 and 1923 (e.g., by Max Liebermann and Edvard Munch). Further on, the exhibition showed, in loose chronological sequence, work groups of the subsequent decades, ending in Space 8 with works created between 1967 and 2005 (e.g., by Imi Knoebel and On Kawara). The grouping in this category can therefore also be described as a grouping by the "Age" of the artworks.

Analyzing these spatialized chronological clusters out of the factors Curative Quality; Dominance; Surprise/Humor; Negative Emotion, only Aesthetic Quality shows significant results. Neither the scientific team nor the museum director or his curator, with whom we discussed the results of the present article, expected these descending ratings of "Aesthetic Quality." We agreed that it is rather unlikely that a "museum fatigue effect" had a strong impact on the ratings, because the average visiting time of the exhibition was only about 30 minutes. In reference to Figure 9b, where the ratings of Surprise/Humor of the eight architectural groups are shown, a primacy effect can be excluded as well. It is convincing that the pop-artworks in Space 7 received the highest rankings in the category "Surprise/Humor."

Table 4. Mixed Effects Models of the Associations of "Style" Categories with Aesthetic-Emotional Assessments

Dependent variable	Fixed effect "Style": *F*-test, explained variance	Random effect "artwork": variance component	Random effect "subjectID": variance component	a	b	c	d	e	f	g	h	i[a]	j
Aesthetic Quality	4.6%****, 15.1%	7.5%	19.3%	+****						–*		–	–*
Surprise/Humor	6.6****, 19.8%	7.1%	20.1%	–****	–*	–*		–*				+	+****
Negative Emotion	1.2 ns, 13.6%	6.8%	18.6%										
Dominance	0.8 ns, 12.0%	10.6%	12.7%										
Curative Quality	2.4*, 11.8%	6.4%	22.0%	–*			–*			+*			

[a]These values were estimated on the basis of fixed effects regression.
Note: ns, not significant; + Larger than average; – smaller than average.
*$p < .05$; **$p < .01$; ***$p < .001$; ****$p < .0001$.

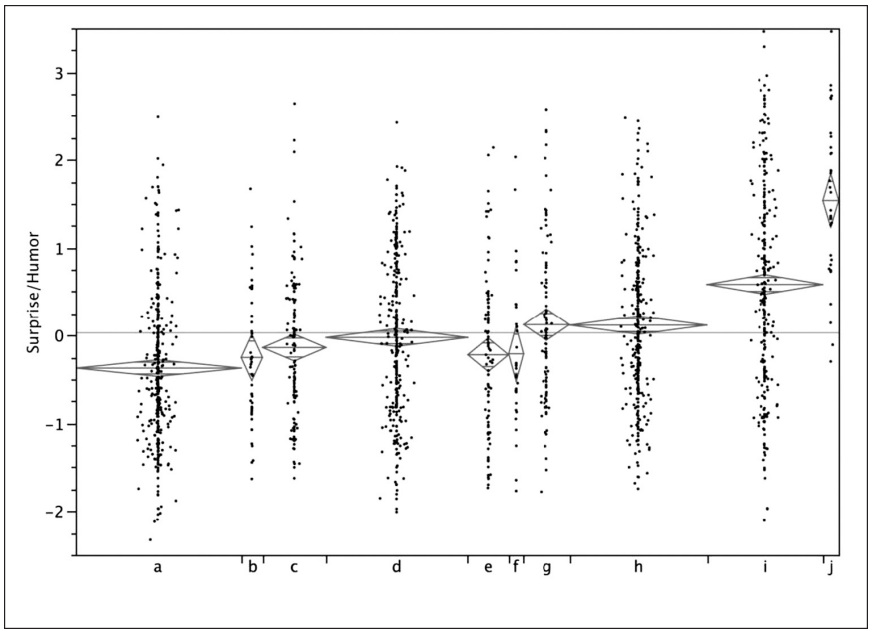

Figure 8. Ratings of "Surprise/Humor" for the ten different styles. The black dots indicate the ratings per participant for the respective style category.

Therefore, we presume that the items of the factor "Aesthetic Quality" (the work is rated as pleasing; beautiful; emotionally moving; well done with respect to technique, composition, and content; artist and importance in art history) are maybe not fully adequate for contemporary artworks. It is, for example, rare that a contemporary artist has already reached renown in art history. We suggest that the 19 items (Table 1) to rate the artworks in the post questionnaire should contain two more questions, such as "The work is conceptually strong . . ." and "The work is interesting . . ." to describe the effects of contemporary art on the beholder adequately.

Nevertheless, the overall statistical findings in this field study clearly indicate that the Medium of the artwork highly correlates with the factor "Aesthetic Quality," Style with the factor "Surprise/Humor," and *Age* again with the factor "Aesthetic Quality." Besides these empirical ratings, we could also demonstrate that the physiological measures of the heart rate variability and the skin conductance variability strongly correlate to the ratings conducted by the

Table 5. Mixed Effects Models of the Associations of Architectural Groupings with Aesthetic-Emotional Assessments

Dependent variable	Fixed effect "Architecture": *F*-test, explained variance	Random effect "artwork": variance component	Random effect "subjectID": variance component	S2	S3	S4	S5	S6	S7	S8[a]
Aesthetic Quality	8.8****, 21.4%	8.5%	17.0%	+****	+**			–*	–**	–
Surprise/Humor	4.2**, 17.9%	7.5%	20.1%	–*	–*				+***	
Negative Emotion	1.5 ns, 12.1%	6.6%	17.9%				–*			
Dominance	4.6***, 13.3%	7.0%	11.3%				–****	+**		
Curative Quality	1.0 ns, 9.4%	9.0%	22.7%							

[a]These values were estimated on the basis of fixed effects regression.
Note: S = Space; ns = not significant; + Larger than average; – smaller than average.
*$p < .05$; **$p < .01$; ***$p < .001$; ****$p < .0001$.

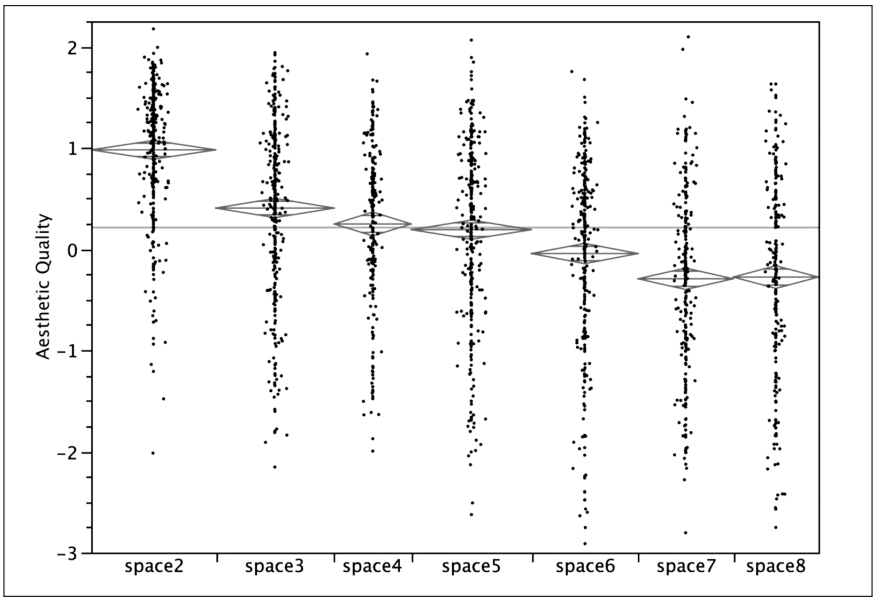

Figure 9a. Ratings of “Aesthetic Quality”of the eight architectural groups. The black dots indicate the ratings per participant for the respective category.

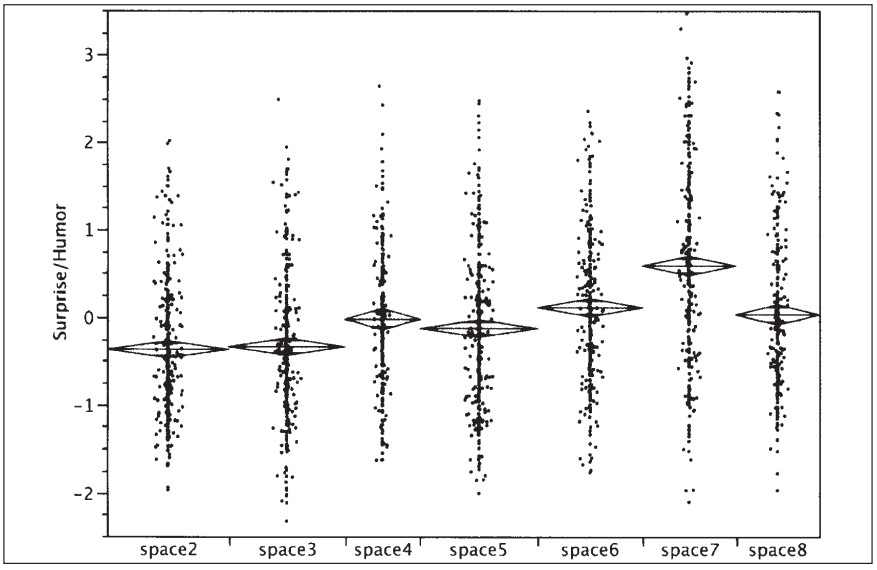

Figure 9b. Ratings of “Surprise/Humor”of the eight architectural groups. The black dots indicate the ratings per participant for the respective category.

questionnaires (Table 2). These findings will now be complemented by the information cartography displays.

PSYCHOGEOGRAPHICAL RESULTS, INFORMATION MAPPINGS

In the following section, we will analyze the effect of artworks on the visitors, their behavior and reactions to the newly developed psychogeographical research methods and the cartography display. We will direct our focus to the effect of single works.

In the preparation for the exhibition we formulated several hypotheses about different kinds of artworks. In cooperation with the museum director and the chief curator, the research team developed this catalogue of research questions:

- Does *a famous compared to an unknown artwork* by the same artist in the same curatorial environment cause different affects on the visitors?
- Do *two similar artworks* from the same artist, hanging in the same place, cause the same visitor reactions?
- How does the *manipulation of an artwork* effect the visitors' reception? Does it lose its "holding power," if it gets manipulated?
- Does *an "A-Work"* cause different visitor reactions than *a "B-Work"?*
- Does *an artwork in different configuration* change the atmosphere of an exhibition room?

Taking these questions as a starting point, the works that represent these criteria were chosen by the museum director and the curator in order to test their effects empirically. We will discuss these effects using the psychogeographical cartography.

Famous and Unknown Works

Andy Warhol, "Campbell's Condensed Tomato Soup," 1962 certainly is one of the most famous artworks of the 20th century and an icon of pop art. "Flowers," 1966, is much less known (Figure 10). Both artworks were shown in the exhibition, they were placed next to each other, in the same architectural and curatorial surrounding. Both works have comparable sizes (30 × 23 cm / 35 × 35 cm). In both, red dominates, both have a similar "age" and both are on canvas (oil/oil and serigraph).

The following figures display visitor reactions to these works. The Region Viewer (developed by the eMotion team) displays the average time spent in a region in front of an artwork per visit (Figure 11, "The total time spent in this region in front of an artwork" divided by "number of visits of this region"). The brighter

Figure 10. (left to right): James Rosenquist, "Bild mit Glühlämpchen," 1962, light on (Place ID 54) / Roy Lichtenstein, "Yellow Landscape," 1965 (Place ID 55) / Andy Warhol, "Campbell's Condensed Tomato Soup," 1962 (Place ID 56 / Andy Warhol, "Flowers," 1966 (Place ID 57).

the region in the cartography, the less time per visit was spent there.[9] In both Figures 11 and 12, the ground floor is presented by black lines. The pictures on the walls are depicted by grey rectangles. The region of the artwork is represented as a very light grey field (sometimes overlapping, due to technical reasons). The figure clearly indicates that the average viewing time for the two artworks is similar. In average "Flowers" was viewed for 9 seconds "Campbell's Condensed Tomato Soup" for 10.5 seconds (the work with the longest average viewing duration in the exhibition was "Antibild" with 34.5 seconds.) Interestingly, the visitors did not spend much more time in front of "Campbell's Condensed Tomato Soup" than in front of "Flowers" which can be seen in Figure 11.

Figure 12 shows the paths of 30 randomly chosen museum visitors, depicted as fine, grey lines. The faster a visitor moves, the brighter a line gets. In the absence of movement lines become black. The bright grey (in color: yellow) round markers indicate the fluctuation of heart rate (HRV); the fluctuation of skin conductance (SCV) is indicated by dark grey (in color: orange) round markers. The more intense the HRV and SCV, the larger the marker in the figure. In an overall analysis, we found strong correlations of HRV with

[9] Visits shorter than three seconds were ignored in order to reduce the influence of "passing through"-effects.

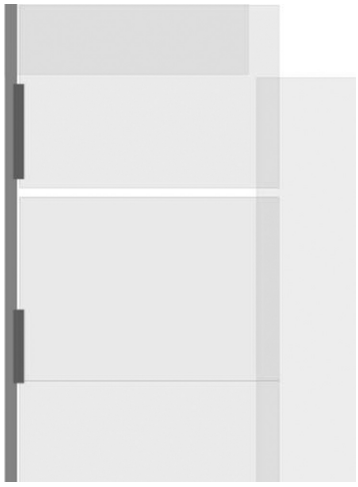

Figure 11. Region Viewer, Situation 0, Space 7, n = 110. Left side on the top Warhol, Flowers. Left side in the middle, Warhol, "Campbell's Condensed Tomato Soup."

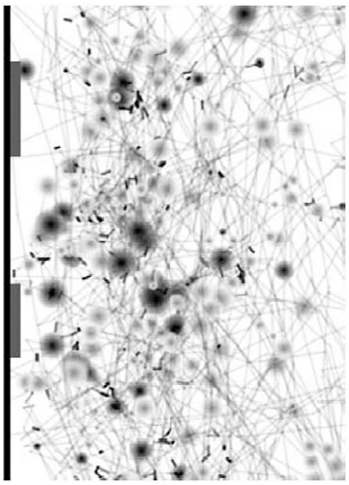

Figure 12. Situation 0, paths and physiological reactions of 30 visitors, Space 7.

factors "Aesthetic Quality," "Surprise/ Humour," and a moderate correlation with "Curatorial Quality." According to the psychophysiological literature, SCV is linked to emotional processes. We found correlations of SCV with the factor Dominance, i.e., when a visitor rated a work as strong and stimulating (Tschacher et al., 2012). Physiological markers were shown at those points of the trajectory where HRV or SCV deviated, in a moving window of 2s, by > 2% from the global mean of the respective visitor.

In the close-up view of the two works in Figure 12, it is apparent that the visitors were looking very closely at the works and that they had significant physiological reactions. The label of the works on display were placed on the right side of the works. We also clearly see the reactions of the visitors reading the label of "Campbell's Condensed Tomato Soup." The physiological reactions are much higher in front of "Campbell's Condensed Tomato Soup," which is especially shown by the dark grey (orange) markers. Also more visitors view this work which can be seen by the density of the lines. In total, in Situation 0, the region in front of "Campbell's Condensed Tomato Soup" was visited 183 times, the region of "Flowers" 109 times. In Figure 12 we can even see two attraction centers concerning the work: One in front of the work and one to its right side

Figure 13. Situation 0, Ferdinand Hodler, “Bildnis Frau Loup.”

closer to the wall. The first group is affected by viewing the work itself, the second group by reading the wall label. Even though “Campbell’s Condensed Tomato Soup” is the slightly smaller and more abstract work, it creates much stronger sensations in the visitors. We assume that the reason is the work’s broad popularity and that the encounter with the “original” may cause these strong effects.

The Effect of Two Similar Artworks

Furthermore, we wanted to test the effects of two similar artworks. Therefore, we chose two works by Ferdinand Hodler, “Selbstbildnis” [selfportrait] and “Bildnis Frau Loup” [Picture of Miss Loup] and hung them both at the same place (Place ID 8). In Situation 0, “Bildnis Frau Loup” (Figure 13) was presented, in Situation 3 “Selbstbildnis” (Figure 14). Both works are similar, both are portraits, have similar sizes, are of the same material (oil on canvas) and a similar painting technique, show a similar brownish coloring, and are similarly framed. “Selbstbildnis” was painted in 1917, “Bildnis Frau Loup” in 1912, thus their age is comparable. Because of these similarities, our hypothesis was that there would not be any significant difference in the physiological response or behavior of the visitors.

Taking a look at Figures 15 and 16, the similarity of the two works is evident. Not only the density of the paths in front of the pictures is very similar, but also

Figure 14. Situation 3, Ferdinand Hodler, “Selbstbildnis.”

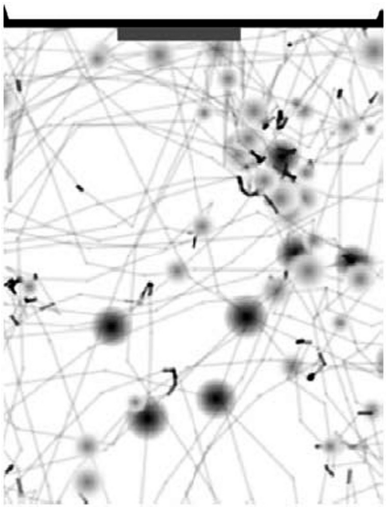

Figure 15. Situation 0, paths and physiological reactions of 30 visitors. View in front of Hodler, Bildnis “Frau Loup.”

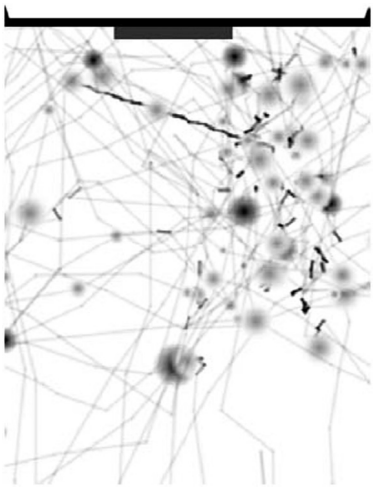

Figure 16. Situation 3, paths and physiological reactions of 30 visitors. View in front of Hodler, “Selbstbildnis.”

their patterns. Furthermore, the proximity/distance behavior to the artworks is similar. In both figures, the positioning of the attraction center makes obvious that the visitors stand a bit to the right of the works and read the text labels on the wall. In both pictures HRV indication dominates (bright grey markers). Comparing these two figures with Figure 12, one can say that neither "Bildnis Frau Loup" nor Hodler's "Selbstbildnis" attract the visitors of this grouping of 30 very much. Comparing the average time spent in front of the two regions per visit, the average time spent in front of the "Selbstbildnis" is just slightly higher (14 versus 12 seconds) than time spent in front of "Bildnis Frau Loup."

All in all, the two similar works have similar effects on the visitors' behavior, and the physiological reactions they cause are minimal. This may also be another indicator for the reliability of our research method. Interestingly, compared to the one of the "superstars" in the exhibition, Warhol's "Campbell's Condensed Tomato Soup," both works by Ferdinand Hodler caused fewer physiological reactions although the two portraits were being viewed for slightly longer periods.

Manipulation of a Work

How does the *manipulation of an artwork* effect the visitors' reception? Does it lose its "holding power," when manipulated? This was another research question we wished to test. Therefore, a work was chosen that could easily be manipulated without destroying the work itself.

We selected James Rosenquist's "Bild mit Glühlämpchen," 1962, because it was possible to switch off the light (an integrated reflector of a pocket light) as an experimental setting (situation 1) (compare Figures 17 and 18). Our hypothesis was: As long as the light is turned on, the rather small but eye-catching work would be able to attract the visitors' attention, because of its material constitution. Consequently, if the light is turned off, it would lose its attraction power to a much larger and louder work next to it, a work by Peter Phillips called "Exterminator" (1968) (Place ID 53) (Figure 19). Does this manipulation of the artwork have any effect on the visitors and their behavior?

This hypothesis was supported. As long as the light in the small but eye-catching work is turned on, the interest of the visitors is drawn to it. In Figure 19, the visitor paths are more horizontal, the visitors pass through the door and walk directly toward the work of Rosenquist. Almost nobody moved close to the work of Peter Phillips, "Exterminator." Although it is a very loud and disturbing work, visitors do not pay much attention to it. But as soon as the light is turned off (Figure 20), Rosenquist's work loses its attraction power. The visitor paths change from horizontal to vertical directions—visitors become drawn to the work "Exterminator" and more visitors approach that work closer. Now, its "loudness" causes strong physiological effects, which can clearly be seen in Figure 20. Even on the Figures 17 and 18, it is noticeable that by turning off the light, the atmosphere completely changes. One may say that it shifts from an eye-catching,

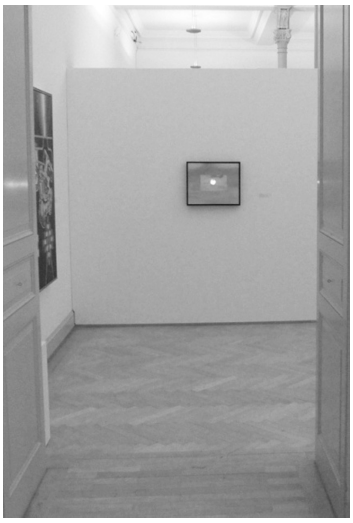

Figure 17. Situation 0, James Rosenquist, “Bild mit Glühlämpchen,” 1962, *light on.* View in direction of the visitor circuit.

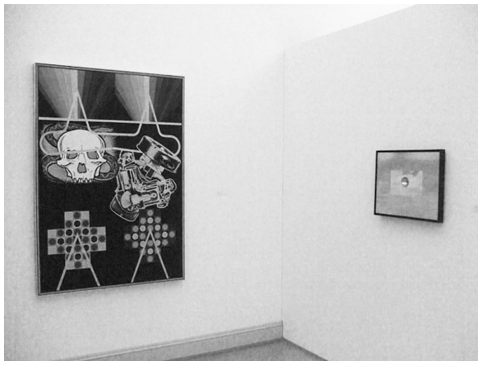

Figure 18. Situation 1, James Rosenquist, “Bild mit Glühlämpchen,” 1962, *light off* and Peter Phillips, “Exterminator,” 1968.

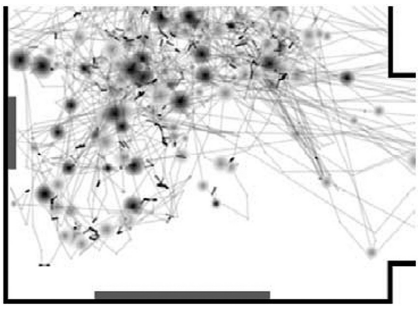

Figure 19. Situation 0, Paths and physiological reactions of 30 visitors, in front of Rosenquist, “Bild mit Glühlämpchen.”

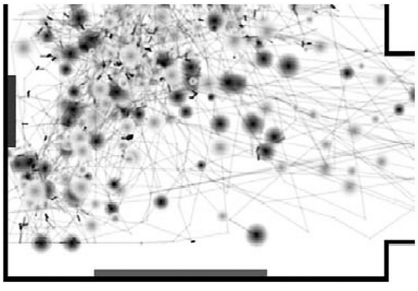

Figure 20. Situation 1, Paths and physiological reactions of 30 visitors, in front of Rosenquist, “Bild mit Glühlämpchen” and Phillips, “Exterminator.”

humorous and intelligent to a destructive and cold atmosphere. Shutting off the light was a small, but very influential act.

Two Landscapes or "A- and B-Art"

We were also interested in the effects of two different landscapes: Hans Krüsi, "Hügellandschaft mit drei Häusern" [three houses on a hilly landscape] (Place ID 58, Space 7) (Figure 21) and Walter Kurt Wiemken, "Meeresgrund" [bottom of the sea] (Place ID 21, Space 4) (Figure 22). Both artworks were positioned in comparable architectural surroundings in the exhibition, on the right hand side of the visitor, when entering the spaces. Both works have similar dimensions, similar framing and both show imaginative landscapes, one in the mountains, one under water (see Figures 23 and 24). Hans Krüsi (1920-1995) was an orphan who received very little education. He worked as a gardener on a farm and later as a salesman of flowers in Zürich. Krüsi started painting as an autodidact and sold his works on flea markets. To this day, his reputation as an artist is still being debated. In contrast to this, Walter Kurt Wiemken (1907-1940) studied art in Basel and Karlsruhe and was exhibited in prestigious institutions (for example at the Kunsthaus Zürich or the Documenta 1). With these two landscape paintings, we wanted to test an "A-Artwork" (Master work) and "B-Artwork" to see if they cause different visitor reactions.

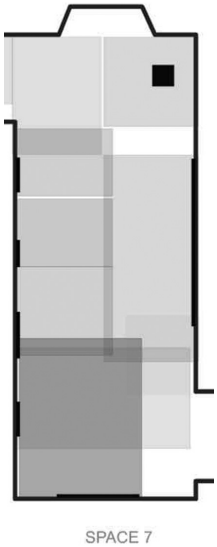

Figure 21. Region Viewer, Space 7, Situation 0, on the right side, in the middle "Hügellandschaft mit drei Häusern."

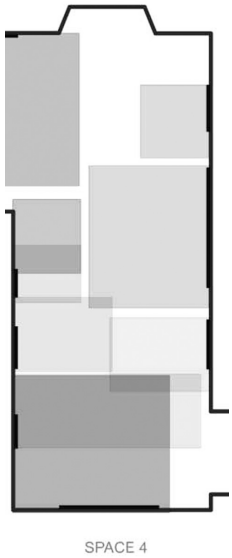

Figure 22. Region Viewer, Space 4, Situation 0, on the right side, in the middle "Meeresgrund."

Figure 23. Visitor with electronic glove in front of Hans Krüsi, "Hügellandschaft mit drei Häusern."

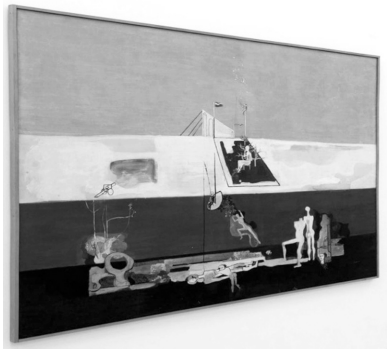

Figure 24. Walter Kurt Wiemken, "Meeresgrund."

Even the spatial situation is similar, the visitor behavior to the two artworks is slightly different: the region of the work "Hügellandschaft" was visited 171 times in situation 0, the average viewing duration only was 8 seconds. "Meeresgrund" was visited 227 times with an average viewing duration of 12 seconds. The region viewer indicates this slightly longer viewing duration of the surrealistic painting by Wiemken. What can be seen in analyzing the paths of the visitors?

Comparing the path mappings in Figures 25 and 26, Wiemkens' "Meeresgrund" evokes stronger physiological reactions. There is an attraction center in front of the work, where the visitors' paths lines become denser and darker. Museum visitors clearly gave more attention and paid more interest to this work. At first glance, this obvious difference in the effects of an "A-Work" is surprising. Regarding our Hypothesis that the "A-work" has significantly stronger effects on the visitors, we have to put into perspective that the two artworks are too different to generalize the result and reach a general conclusion. Therefore, a series of experiments with "A-" and "B-works" would have to be conducted in the museum for this conclusion to be generalizable.

An Artwork in Different Configurations

Does an artwork in different configurations change the atmosphere of an exhibition room? In exhibition Space 8, we conducted several experiments with the artwork "Treibriemen-Skulptur" [driving belt sculpture] by Thomas Virnich. This work is made of plywood, leather and color and can be displayed as one piece or, when taken apart, in several pieces. It was shown in Space 8, together with works by Imi Knoebel, On Kawara and Franz Wanner and others. We were interested in how the different configurations of the piece

Figure 25. Situation 0, paths and physiological reactions of 30 visitors, in front of “Hügellandschaft mit drei Häusern.”

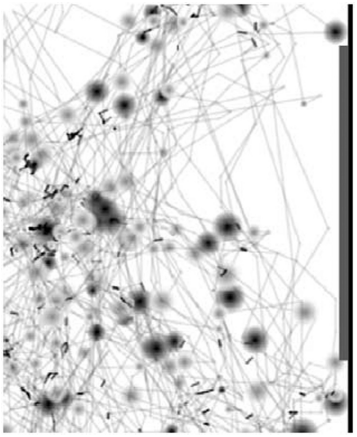

Figure 26. Situation 0, paths and physiological reactions of 30 visitors, in front of “Meeresgrund.”

Figure 27. Situation 0, Thomas Virnich, Treibriemen-Skulptur, 1989, compact. **Notes**: With the work “Treibriemen-Skulptur” in a **compact** form, the exhibition space gives a clear and structured impression: The artworks are put in an expected order, the display situation is a typical museum situation: Some works on walls and a sculpture on the floor, with enough space to walk around it. The atmosphere can be described as rather neat and conventional.

would change the visitor reactions. Therefore in situation 0 (Figure 27), the work was displayed in one piece. In situation 1 it was displayed in parts (Figure 28), in situation 3 (Figure 29) the work was replaced by a bench. (In situation 2 it was taken away and the space was left empty. The visitor reactions resemble very much those of situation 3, we therefore do not address that situation in detail.)

In Figures 30, 31, and 32, the effect and affect of 30 randomly chosen visitors (their paths and their physiological reactions) are displayed in the three different situations. The straight, black lines are tracking failures and have to be ignored.[10]

Comparing the three photographs of situations 0, 1, and 3 and the three Figures (22, 23, and 24) displaying the locomotion and physiology of the museum visitors, it is astonishing how strong the spatial arrangement and the atmosphere of the exhibition space effect and affect the visitors and how their visual perception is represented in their physiological responses. The information display clearly mirrors the visitors' sensations of the atmosphere in the space, in terms of an embodied phenomenology.

CONCLUSION

In the discourse of philosophical aesthetics, the term "atmosphere" still is relatively new and sparsely used. In everyday life, however, we often talk about atmospheres and qualify them as bright, dark, powerful or oppressive, we distinguish different atmospheres by their characteristic features (Böhme, 2001). Atmospheres, each with their specific characteristics, occur in space. They are "tuned space," and by entering a room, one may adopt a certain mood. This space can be an actual architectural space (e.g., the "Spaces" of the section above), or an "affective space," the atmosphere evoked in front of an artwork, which was called "region" in the project. Böhme (2001) defined atmospheres as "undetermined spatially diffused moods," and as "quasi-objective" (p. 47). He described this affective field between space, object and observer as follows:

> Atmospheres are apparently neither states of the subject nor attributes of the object. Nevertheless, they are experienced only in the actual perception of a subject and are constituted in their "being-something," their character, through the subjectivity of the perceiver. And although they are not properties of the objects, they are seemingly being produced through the properties of the objects and their interaction. In other words, atmospheres are something *between* subject and object. They are not something relational, but the relation itself. (Böhme, 2001, p. 54) (Translation by the authors)

[10] From the point the tracking signal of a visitor got lost, to the point the person could be tracked again, a line is drawn. On this line the physiological data is attached as orange and yellow markers, according to the time the data was sent to the server.

Figure 28. Situation 1, Thomas Virnich, Treibriemen-Skulptur, 1989, in parts.
Notes: Dismantling the artwork "Treibriemen-Skulptur" and **spreading** it in the exhibition space, the impression of the space becomes more dynamic and slightly more dramatic. Visitors are now also confronted with something which cannot be so easily seen as "one work" and they have to be more attentive when walking through the space.

Figure 29. Situation 3, Bench.
Notes: Removing the artwork "Treibriemen-Skulptur" and replacing it by a **bench** immediately changes the atmosphere of the room again. A clean, straight, and slightly contemplative / intellectual impression evolves.

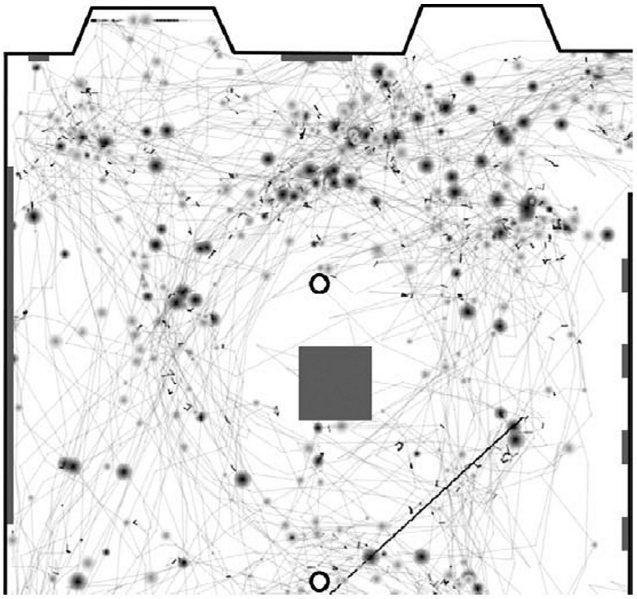

Figure 30. Situation 0, Paths and physiological reactions of 30 visitors, in Space 8. Viernich, Treibriemen-Skulptur, **one piece**.
Notes: The visitors enter the exhibition Space 8 in the top right hand corner. They stop and show a reaction, which one can see at the clustered physiological reactions. Afterwards, they move around the sculpture in one piece. This reaction and behavior can be described as "normal." The visitors perceive the compact, wooden sculpture on the floor and consider it as an artwork. This is indicated by their behavior: Stopping, watching, moving on.

We attempted to make the effect of such phenomenological perception visible as a physiological reaction. The phenomenological experiences, spatial arrangements and their atmospheres, or the "strengths" of single works or work groups are not only aesthetic-philosophical concepts, they indeed have a strong impact on the physiological response of the beholder: art reception as sensing an atmosphere is an embodied-cognition process. Instead of a subject-object perspective, we conceive art reception as highly embodied. Only those viewers who sense an atmosphere and are willing to be brought into a certain mood, i.e., to experience themselves, experience the sensual quality of the object and its disposition. This does not mean that "art" is being reduced to its sensual, aesthetic-emotional side with its critical potential being disregarded. It does, however, mean that one should give more attention to the sensual experience as an embodied process.

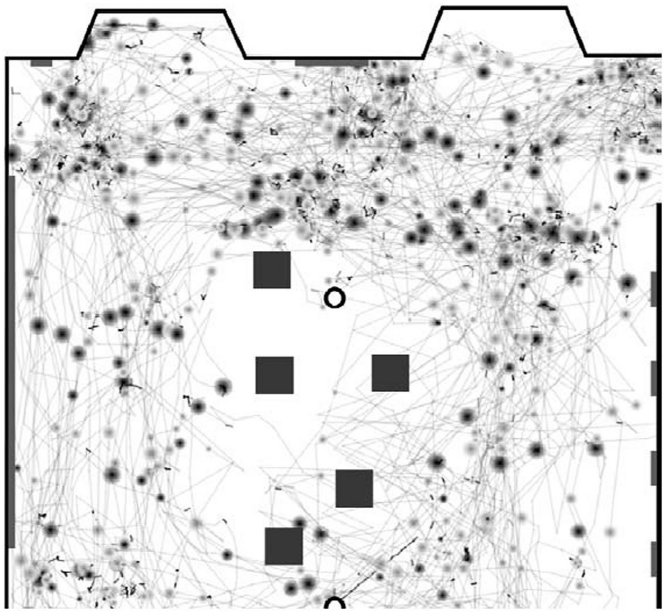

Figure 31. Situation 1, Paths and physiological reactions of 30 visitors, in Space 8. Viernich, Treibriemen-Skulptur, **in parts**.
Notes: Again the visitors enter the exhibition Space 8 in the top right side. But now, their reactions are very different. The parts of the sculpture are spread out through the room. This altered spatial arrangement obviously causes very different physiological responses. The dramatic and dynamic room situation seems to have a direct impact on visitor reactions. The change of the sculpture is not just effecting the reactions to the sculpture itself, but also changes the presence of the other works in the room and the atmosphere of the space.

LIMITATIONS AND PERSPECTIVES

We are well aware that the results of this project about the effects of artworks on the beholder cannot be readily generalized. But the findings may serve as a first step toward a new understanding of embodied phenomenology of art reception. Following the transdisciplinary design of the project, we are convinced that research in aesthetics can overcome the separation of empirical, philosophical, or purely sociological perspectives in aesthetics. An adequate understanding of aesthetic effects on the beholder will necessarily have to combine artistic, empirical, statistical, and experimental methods, on which observations and their interpretations can be based. We are not postulating an empirical bottom-up aesthetics "Ästhetik von unten" ["aesthetics from below"] or a philosophical top-down

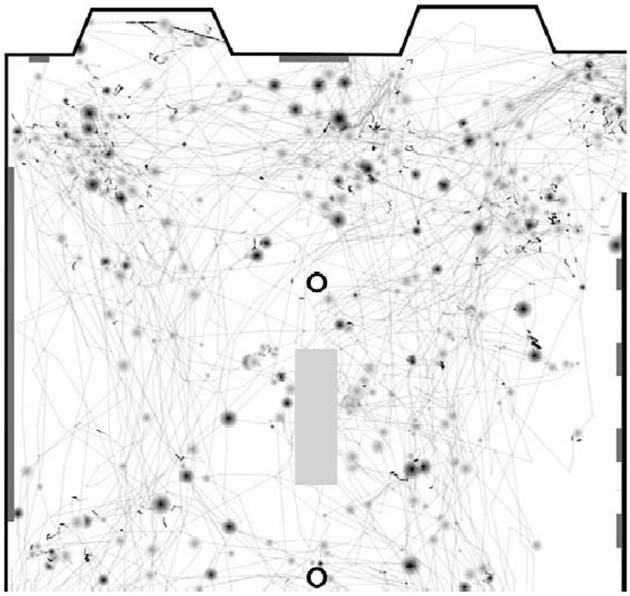

Figure 32. Situation 3, **bench** Situation 0, Paths and physiological reactions of 30 visitors, in Space 8.
Notes: The dark grey SCV markers are nearly diminishing the whole impression is now much cooler and even "distant."

aesthetics "Ästhetik von oben" ["aesthetics from above"]; neither do we aim at a strictly object-oriented, nor strictly observer-oriented aesthetics research: instead the goal is ultimately *integrative aesthetics,* which transcends the methodological and theoretical purism of the disciplines. This article is one of several in the research project eMotion, which contribute to such a transdisciplinary understanding of art reception.[11]

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[11] Several articles discussing different research questions of eMotion are in preparation or in print. For an overview, see www.mapping-museum-experience.com/en/publications

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All Figures: eMotion.

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