

# Empirical Approaches to Studying Art Experience

Claus-Christian Carbon

Department of General Psychology and Methodology, University of Bamberg, Germany  
Research Group EPÆG (Ergonomics, Psychological Aesthetics, Gestalt), Bamberg, Germany  
Bamberg Graduate School of Affective and Cognitive Sciences (BaGrACS), Bamberg, Germany  
E-mail: ccc@experimental-psychology.com

---

**Abstract.** Art experience means the rich experience of artistic objects that are mostly embedded in situational, social, and cultural contexts: for instance when encountering art in art galleries or museums. Art experience lets us reflect on the content, the style, and the artist behind the artwork—moreover, it lets us reflect about the percept, perception, the world, ultimately: about us. Current works in the field of empirical aesthetics unfortunately often ignore context factors that are so important for such deep and far-reaching experiences. Here I intend to refer to the different paths of measuring art experience via Path #1 by testing within the ecological valid context of art galleries via field studies, via Path #2 by simulating certain contextual and perceptual factors in a lab-oriented study design and via Path #3 by testing art-related material in labs without paying attention to such factors. The way we research art experience drastically changes the quality and nature of the output, especially if we ignore certain essential factors which are typically involved when encountering art galleries in real life via Path #3—mainly because participants do not show the typical motivation, interest and effort which they would typically face in art galleries. Furthermore, because the depiction quality of artworks, the context and the social situation in which they are inspected is fundamentally different in the lab, the respective impression is also very different. As most research ignores such factors, we might often be misled by the results of such studies; especially when the extraordinary and unique cultural status that makes artworks so different to ordinary objects is ignored. The paper aims to guide researchers in finding the right study paradigm and best measures to answer their regarding research questions most adequately. © 2019 Society for Imaging Science and Technology. [DOI: 10.2352/J.Percept.Imaging.2019.2.1.010501]

---

## 1. INTRODUCTION

Empirical aesthetics is an emerging interdisciplinary field. Although originating from the very early days of experimental psychology—a field founded by Gustav Theodor Fechner and others back in the 1860s [1]—it was put in the back seat for a very long time. In recent years, empirical aesthetics underwent a kind of renaissance, specifically focusing on the aspects of art perception and art experience. In the present paper, we will mainly be interested in art experience, as this concept provides an interesting opportunity to integrate multisensory channels [2], to learn about the relationship between cognition and emotion [3, 4], and to understand art

experience as a complex and highly dynamic psychological process [5].

### 1.1 Art Processing, Experiencing Art and the Art of Epiphanizing

Art experience is a rather complex concept [4]. By the very nature of experiencing something, it always refers to a process [6]. The process of experiencing something, e.g., an artwork, is characterized by intense involvement during the process and by gaining “experience” or becoming “experienced” as an outcome of this process. A long series of such deeply involved episodes of experiences can even lead to what we call “echtes Seherlebnis” in German, which might be roughly translated as “true viewing experience.” Most of the episodes we experience, however, are not deeply processed further, and so the respective events will not yield profound, elaborated experiences, and probably will not lead to deep memory traces. To contrast the role of elaborated experiences, which lead to insights and might even lead to expertise in the longer term, we will employ the specific term *epiphanizing* (see also stage 5 “Schema-change/aesthetic outcome” in the model of [4]) in contrast to the shallow and more trivial type of experience which should be better termed by the neutral term *processing*. This needed dissociation is similar to Dewey’s [7] distinction between a facile, mere object-based and non art-specific component of art processing which he calls “recognition” and a more complex, elaborated and art-specific component which he calls “perception”; as perception typically covers both aspects, we prefer the above mentioned terminology instead.

*Epiphanizing* is generally signified by deep involvement; epiphanizing is a catalyst for dragging attention and creating meaning, it has the power of altering awareness and can result in long-term alterations of the perception of the self and the way we perceive and interpret the environment. I would like to characterize epiphanizing in the field of art reception (which I will call *Art epiphanizing* in the following) by deep experiences when perceiving artworks, elaborating and reflecting on them and debating about them in social interchanges with others or just by social pressure via others’ assessments [8]. Most art processing models focus on the very early, superficial and mostly *visual* aspects of art perception; other sensory inputs than visual ones are

---

Received Apr. 30, 2018; accepted for publication Jan. 29, 2019; published online Mar. 13, 2019. Associate Editor: Michael Webster.  
2575-8144/2019/2(1)/010501/7/\$00.00

hardly addressed [2] with some exceptions in the fields of aesthetic processing in theater (e.g., [9, 10]) and design perception (e.g., [11]). Even if such models include more elaborated states, they claim that the result is a determinate one, very similar to problem solving (e.g., [12]). They mostly neglect or do not explicitly address some important aspects of the perception of many artworks, inter alia, the ongoing character of “elaborating” (challenging) artworks [13], the “stream of experience” [14], aesthetic aha moments [15], the social and situational aspects of art [16], and the interactive [17], debating, criticizing and challenging [13, 18], and even transformative [19] processes that evolve while experiencing art (research that explicitly addresses such extraordinary and ongoing processes are, for instance, [4, 20]).

In short, art epiphanizing is characterized by an intense form of art experience which shows aesthetic aha moments and typically but not necessarily transformative aspects, which altogether lead to very memorable episodes loaded with strong affective responses.

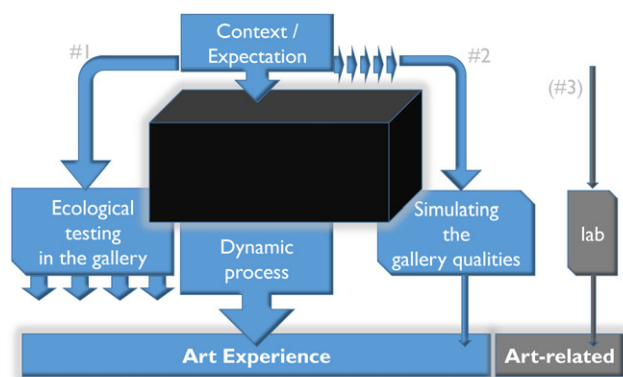
### 1.2 The Problem of Measurement

The capturing of experiences is a major challenge for the social and human sciences. Three fundamental issues make measurement very demanding: (1) Experience is a personal thing—what others really experience is mainly covered. (2) Experiencing something is a process *in situ* without a definitive onset and length. Experiencing art, especially the deep form of *Art epiphanizing*, enhances the generally challenging situation as artworks are typically experienced within museums and often together with other persons in a socially and culturally embedded context. (3) Experiencing is a multi-step process—for instance, in the domain of art experiencing, we can think of at least five microgenetic steps going on rather subsequently: perception, implicit classification, explicit classification, interpreting, and evaluation [12, 21]. All these characteristics essentially delimit the application of rigorous experimental approaches. On the side of the beholder, *Art epiphanizing* is strongly modulated by trait factors such as personality [22] and expertise [23] and by state factors such as mood, expectation and purpose when encountering art (see [24]). It is further mediated on the side of the artwork by the framing [25], presentation quality of the artwork and the artworks being around [26], depiction size [16], and by the way the artwork is presented [27].

The most severe problem is that which psychology generally has: making the mental and often implicit processes decipherable, explicit, and measurable—and this without changing, biasing or even halting the mental process, i.e., the experiencing, while doing so. To solve this issue is virtually impossible: we do not have an adequate translator at hand for making mental processes explicit. The field of psychology has developed a broad variety of methods to partly address this issue by combining different approaches at different levels of data granulation. Most measures are quite sophisticated due to the usage of advanced technical equipment, but they still lack the phenomenological babel fish that is capable of trans-

forming the phenomena of consciousness and experience into measurable units. Shifting this fundamental problem of phenomenology from psychology to neuroscience is thereby of no help at all. With methods of neuroscience we seem to have the magic key to the “objective basis” of experience in hand seeing as we can measure—or at least deduce—neural activity, but we quickly understand that we cannot exercise on an adequate level of data in this respect. Neuroscience can tell us important information about the location of the processes—even about when and where different kinds of information are interconnected, transformed or sent further—but the holistic phenomenon itself breaks down into neural bits.

A similar effect is caused when the standard experimental approach is employed: Experiments aim to cut down phenomena into manageable parts that can be independently varied. This is the only procedure that allows for causality to be tested and for effect sizes to be calculated for. For instance, in order to analyze the aesthetic appreciation of a Mondrian-like painting, experimenters might change the thickness of black lines, the hue of a certain square and the size of the painting independently. The essential problem with such structuralistic approaches is the neglecting of holistic phenomena—the Gestalt as a perceptual phenomenon is not just the sum of the parts but emerges from these parts [28]. The particular interaction between specific levels of different variables can instantly create a new quality of percept. Gestalts are not just linear extrapolations from certain qualities, but show disruptive changes in quality (cf. [29]). Just altering the hue in one square or the thickness of one line might have the power to create an extraordinary aesthetic appeal or its opposite, the collapse of visual rightness leading to an aesthetic rejection of the entire work. Gestalt phenomena work due to holistic processing, so contextual effects play a major role in potentially elevating a despicable “greasy corner” to an artistic “Fettecke” made by Joseph Beuys [30]. It is quite remarkable that the initial, and still advocated, method of researching empirical aesthetics is Gustav Theodor Fechner’s invention of psychophysics: physical stimuli are quantitatively changed and the produced sensations and perception are measured. But this procedure exactly creates the problem of decomposing or even ripping apart the Gestalt, and so the true and deep experience of art as something extraordinary (cf. [31]). This decompositional approach is misleading in further respects. First of all, it measures something different; sometimes fundamentally different to the allegedly targeted phenomenon. Second, this approach creates the illusion that epiphanizing is a process which can be endlessly repeated and systematically varied—but this is not true: sometimes just focusing on the very few artworks for which epiphany is felt is much more goal leading than presenting an endless row of depictions for which participants do not show any interest. Third, any kind of rigorous decomposition means that original artworks can hardly ever be investigated as such an approach has to alter the physical condition or the context factors of an artwork, which is hardly achievable in an art gallery; and so mere



**Figure 1.** Three paths of research in order to gain knowledge on art-related processes. Paths #1 and #2 are for covering what is more about art experience or even art epiphanizing, Path #3 is more about gaining data on art-related processes, sub-phenomena of art experience, or specific aspects of cognitive and affective processes when encountering depictions of art. Art epiphanizing cannot be addressed by Path #3.

depictions, mostly presented on computer screens in labs, are employed instead.

## 2. EMPIRICAL APPROACHES

Research in empirical aesthetics mostly follows three different paths of gaining knowledge on art epiphanizing (see Figure 1): Path #1 the ecological path of testing in the art gallery or museum; Path #2 the path where gallery qualities are simulated to provide contextual embedment; and Path #3 the context-free lab-oriented path.

The ecological path might seem to be the golden way of getting insights into the deep art experience process, as the context of the art gallery is not only simulated or partly mapped, but fully present: Testing in a natural setting actually happens while perceiving and epiphanizing artworks there. The potential data are indeed very rich and ecologically valid [32], but the proper measurement of them is rather hard to achieve; mostly impossible. At the moment when you start asking the museum visitor about her experience, she will artificially rationalize, will alter the typical processing and will potentially detach from affective processing. Path #1 in sum is promising in allowing the development of true art experiences, but the situation is not controllable, the variables cannot be varied and the beholders' experiences can hardly be assessed at all. One typical example of such promising but also hard-to-control empirical work is a recent aesthetic study conducted in an art gallery: [33] compared aesthetic experiences within a real art exhibition in an art gallery with the same material experienced in lab conditions. Although the study was quite revealing in showing heightened appreciation of artistic installations, the expectations beholders had beforehand were also different. This can easily be explained by the mere fact that gallery visitors indeed expect semantic instability [34], high degrees of novelty and a good portion of arousal, but gallery visitors are also per se different persons than people approaching our laboratory—whereas gallery attendees are intrinsically interested, sophisticated

and committed to art in general, typical lab participants might be particularly interested in taking part in a specific study, e.g., to fulfill course requirements. The latter approach and so the typical commitment, involvement and interest in artistic material is mostly different to people who are tested by Path #1 strategies. Thus, Path #3 characterizes a fundamentally different approach, representing most of the research conducted in empirical aesthetics: Here, all research is executed in a laboratory without the aim of simulating or emulating the art gallery context or the typical viewing conditions plus the affective and cognitive parameters that can typically be observed with real-life art visits. Clearly, this approach offers opportunities with low ecological validity, but shows great possibilities of varying, systematically different experimental parameters. Material which might not depend too much on context factors and on personality variables might be adequately tested within such an internally very valid experimental setting. It is important to note that there is also an empirical study which do *not* show differences in the evaluation of artworks when the factors gallery context vs. lab and genuine vs. reproduction were varied [35]—further research has to be executed to qualify this unexpected finding which was not found before when both investigated factors were (inherently) confounded. Path #2 tries to combine the advantages of Path #1 and Path #3 while excluding their more problematic aspects. The main aim is to simulate typical conditions in and with which artworks are epiphanized, while preserving the power and possibilities of an experimental approach. To achieve this aim, the experimenter has to know relevant details on typical viewing conditions, exploration modes, environmental factors and the social discourse about artworks in general (and sometimes even about very specific artworks). This calls for an extensive review of the literature—particularly important are framework or functional process models (e.g., [3, 11, 12, 14, 36]; see for an overview of several models [37])—and for conducting pilot studies on several side aspects and parameters of specific settings. Furthermore, information on typical effect sizes of several factors is needed to balance the employment of different aspects due to their relevance to the targeted effects—with the general problem, of course, that interactive effects between small main effects might lead to very large effects and therefore such interactive effects have to be considered, too. Within Path #2 approaches, we might lose the full width of phenomena regarding art epiphanizing, because the employment of an experimental study strategy reduces the number of variables, but this helps to capture at least these focused variables in an ecologically valid way. It is important to stress that it is in the end not about the number of involved variables but the quality of the variables which we should keep in mind. If we want to address the phenomenon of art epiphanizing and, thus, a process (e.g., how liking and interest dynamically change over time while inspecting an artwork) and not a mere state (e.g., the final liking of an artwork), we particularly need variables that are able to capture such a process as suggested, for instance, by the “stream of experience” concept propagated by [14].

Path #3 seems not to be an adequate method for gaining knowledge on deeper art-specific processes because deeper art experience, much less true art epiphanizing, will not emerge. This path, however, can provide important data on important sub-phenomena and sub-processes which are parts of what we call art experience. So Path #3 can strongly assist and prepare conducting high-quality research via Path #2. And there is a great list of elegantly and systematically conducted experiments which seem to be very worthwhile to follow or adapt for conducting research within Path #3.

### 2.1 Essential Variables for Simulating Art Gallery Contexts

As we have learned from the previous section, Path #1 is theoretically a highly interesting route to gaining knowledge, but we mostly fail to practically reach the possibility of gathering together systematic data due to their embedment in natural contexts which cannot be experimentally treated. Therefore, Path #2 seems to be a kind of golden middle ground, because we retain the typical power of experimental designs from strict lab-oriented research (see Path #3), but participants still behave in ecologically oriented contexts and situations [33, 38]; see for a comprehensive review of factors that could influence our interaction with museum based art [39]—a consequent further step might be to create virtual museum contexts via immersive technology (e.g., [40]). In order to establish such contexts and situations, experimenters need a wide range of knowledge about the factors that play major roles in creating the contexts and situations that propagate deep art experiences—see [16, 41, 42]. Another approach was offered by [33] who used the art gallery as social and physical context, but tested the participants in a separate room. This helped to increase the control level of the study but still framed the study within the art gallery context.

Decisive information about these factors was compiled by researchers who tested or observed beholders directly in the context of an art gallery. Further valuable information was gathered together by empirical studies that systematically varied conditions in such a way that typical gallery conditions were included.

Smith and Smith [41] were among the first researchers who went directly to museums to obtain information on the typical observation behavior of art gallery visitors. Based on their seminal observation study at the Metropolitan Museum of Art in New York City, they provided important data on typical viewing times for several person-related variables such as age, gender, and group size. Just the mere viewing time of 27.2 s for an average visitor is an insightful piece of information as this is far beyond any viewing time condition employed in lab studies. Mostly, lab studies try to rely on the power of randomization and the vast number of stimuli, so efficient presentation time conditions are aimed for. Typically, presentation times in labs of below 3 s are realized, so this is just 1/10 of the natural viewing time condition. When observing visitors in a temporary exhibition in Germany exclusively devoted to the work of Gerhard Richter, even longer viewing times have been registered [16]: on average, 33.9 s for the first

attendance to inspect the artwork and even 50.5 s for the total viewing time comprising all realized attendances. These even longer viewing times underline how fundamentally different museum-hosted versus lab-based processes of artworks might be. The fact that visitors in art galleries often re-attend artworks after a while—we calculated that more than half of the observed visitors (55.3%) re-attended an artwork [16]—especially stresses that such visitors do follow a self-paced and self-directed path through a gallery. This is very much in line with approaches of analyzing the trajectories of visitors self-navigating through a museum in a rather complex way, including re-attendances to artworks after a while [43].

When analyzing the typical distance visitors use to inspect artworks, researchers found similar divergences to typical lab situations. An early work by [44] uncovered viewing distances of between 60 cm and 120 cm when looking at small-sized paintings such as artworks of a size of about an A4 format. Not only did the visitors use much wider distances to artworks in an art gallery—on average about 1.72 m when viewing Gerhard Richter paintings, for instance, see [16]—self-chosen distances were also modulated by the size of a painting. We revealed a simple relationship between the size of an artwork and the self-chosen distance: the bigger the artwork, the farther the distance; actually, we found much larger distances than [44]. Probably, the size of the artworks visitors watched in our study were much larger than those of the Locher et al.'s study. Many museums also restrict the physically possible minimum distance by physical or electronic barriers to prevent touching and penetrating the displayed artwork. In the given case of the Richter exhibition, such a physical barrier was installed about 75 cm away from the artworks [16]. This might be the reason why the mean minimal distance from artworks was about 1.45 m—a substantially larger distance than that used in most setups of research studies in the lab where the utilization of eye trackers or conventional computer screens prevented distances larger than about 50–70 cm (e.g., 67 cm in [45]).

Another aspect revealed by museum field studies was that visitors engage with artworks not always alone but with companions—[41] revealed that one fourth of the visitors in the MET New York wandered around together with at least one other visitor. Such engagement necessarily alters the perception behavior. Whereas single persons might focus deeply on the artwork, socially interacting persons will convey their experiences, discuss their feelings or debate their evaluations with the others. These different behaviors seem to take different amounts of time: Whereas visitors attending the art gallery as singles viewed an artwork for 46.2 s in total, pairs took more time (53.3 s) and visitors attending as a group even employed 73.4 s per artwork. We observed that not only did group size have an effect, but that quality of groups played a role: although groups of people took the most time at artworks, this was only true if these groups consisted of individuals and not family members. In fact families were the most fast-paced attendance type of all, given an average viewing time of just 40.7 s [16]. Still, these

extensive times illustrate the many opportunities to grasp different qualities in a museum than in a typical lab scenario where sometimes even the very restricted presentation times are automatically paced by the experimental program.

There are further factors that should be considered and taken seriously when approaching art epiphanizing. Among them, the sheer size of artworks in museums is often a big perceptual factor. Inspecting Picasso's mural painting *Guernica* from 1937—with a width of nearly 8 m—can never be emulated by a conventional computer screen, which is mostly used in art studies in the lab. Not only is the feeling of sublime destroyed by the reduction of size, the interactivity of the beholder with the painting is instantly lost when looking at *Guernica* from a narrow visual angle. Size indeed matters with regard to art perception [44, 46]. The physical presence of an artwork in its full Gestalt further enriches the quality of experience. We can more holistically view the artwork when it is present in 3D as a true artifact, sometimes even by touching, smelling or hearing it [2]. But it is not only the size and the physical presence of a work of art that makes the difference: Mostly the status of an artwork as an original, as something authentic and as a unique work [47] of an artist is what creates the specific perception mode that potentially leads to art epiphanizing. Unfortunately, the limited resources of research projects mostly hamper the request of using originals in empirical studies, especially if it is about Path #2 approaches.

### 3. CONCLUSION

To validly capture experiences is a challenge, to capture them while perceiving art is even more demanding. The main reason for this is that art experience is a highly complex and undefined process that combines strong cognitive and affective qualities. This process is multimodally triggered and is very much associated with previous experiences, expectations and knowledge. It might be possible to investigate some sub-phenomena and sub-processes using standard lab-based experiments, but devoted interest in artworks, fascination, and love for art (see for more art-related emotions and motivations [48]), can only be validly addressed within the art gallery or within contexts that mimic their conditions. This is particularly the case if the aim is to research and understand deep art experience, which I term “art epiphanizing” within this paper. To be able to simulate such contexts, their key properties have to be known. The present paper shows that some of these properties which have to be addressed are adequate presentation conditions regarding the size of the stimuli, the distance to the stimuli and the possibility to choose the time needed to inspect and to re-attend them. Much harder to achieve is to emulate the sheer value and meaning of an original artwork [47]. If studies explicitly address prestige, authenticity or originality effects, then research has to be conducted within a real museum context (for instance by asking visitors immediately after a visit about their experiences in the gallery, see [49]); if it is more about content factors (e.g., [50]), the original museum context seems less important but still has to be

**Table I.** Recommendation scheme which research strategy should be pursued for which research question—exemplary list. X/- indicates adequate/inadequate test setting, respectively.

Research Question	Path #1 Ecological valid field study	Path #2 Ecologically oriented study	Path #3 Context-free lab study
Real behavior in museums	X	–	–
Typical behavior in museum contexts	X	X	–
Real time demands for inspecting artworks	X	–	–
Preferential inspection of artworks	X	X	X
Multivariate preferences of artworks	–	X	X
Impact of museum context on the appreciation of artworks	X	(X)	–
Singular events of art epiphanizing	X	X	–
Systematic investigation of epiphanizing phenomena	–	X	–
Role of size and texture on the perception of artworks	X	X	(X)
Social interactions of beholders	X	(X)	–
Deep analysis of art experience in single cases	X	X	–
Large number of tests	–	(X)	X
Repetitive testing of participants in several study sessions	–	X	X
Full experimental variations of conditions	–	(X)	X
Investigating transformative processes	X	(X)	–
Onset-related measurement	(X)	X	X
Analysis of microgenetic processes	–	X	X
Impact of personality factors	(X)	X	X
Testing of performance art	X	(X)	–
Testing of specific art events	X	(X)	–
Testing of interactive art	(X)	X	–
Physiological testing	(X)	X	X
Systematic testing the role of expectations	–	X	(X)

taken into account. A last point, which is mostly neglected and hardly addressed at all, is the inclusion of social factors, for instance the mere attendance of others might change the experience of art. The typical social interaction while perceiving art is another issue that might help to more deeply elaborating art. Just recently we have shown that the alleged evaluation of others systematically change the appreciation of others [8]. These factors have to be investigated in more detail in the future.

Empirical aesthetics has a long tradition regarding the relatively short history of experimental psychology, but ecological valid studies are still quite rare and so knowledge concerning art epiphanizing is quite sparse [51]. I hope that future research will go back to museums or to naturalistic settings to investigate and understand the fascinating experiences we potentially gain from artworks, these wonderful artifacts of human culture. Table I might act

as a kind of recommendation scheme when which kind of research strategy should be pursued.

## ACKNOWLEDGMENT

I would like to thank Bernice Rogowitz for organizing the symposium “Art and Perception: Representation, Experience, and Understanding” at the HVEI 2018, and for which I was gratefully invited to hold an oral presentation with the title “Art changes our way of cognitive and affective processing—but how to ecologically validly measure such processes?”—this provided the mental stimulus for the present paper. I am also indebted to very constructive and comprehensive comments provided for a previous version of this paper by three reviewers.

## REFERENCES

- W. T. Fitch and G. Westphal-Fitch, “Fechner revisited: towards an inclusive approach to aesthetics,” *Behav. Brain Sci.* **36**, 140–141 (2013).
- C. C. Carbon, “Creating a framework for holistic assessment of aesthetics: A response to Nilsson and Axelsson (2015) on attributes of aesthetic quality of textile quality,” *Perceptual Motor Skills* **122**, 96–100 (2016).
- S. Markovic, “Components of aesthetic experience: aesthetic fascination, aesthetic appraisal, and aesthetic emotion,” *i-Perception* **3**, 1–17 (2012).
- M. Pelowski and F. Akiba, “A model of art perception, evaluation and emotion in transformative aesthetic experience,” *New Ideas Psychology* **29**, 80–97 (2011).
- C. C. Carbon, “Cognitive mechanisms for explaining dynamics of aesthetic appreciation,” *i-Perception* **2**, 708–719 (2011).
- A. P. Shimamura, *Experiencing Art: In the Brain of the Beholder* (Oxford University Press, New York, 2013).
- J. Dewey, *Art as Experience* (Perigee Books, New York, 1934).
- V. M. Hesslinger, C. C. Carbon, and H. Hecht, “Social factors in aesthetics: Social conformity pressure and a sense of being watched affect aesthetic judgments,” *i-Perception* **8**, 1–16 (2017).
- S. Boerner, J. Jobst, and M. Wiemann, “Exploring the theatrical experience: results from an empirical investigation,” *Psychol. Aesthetics Creat. Arts* **4**, 173–180 (2010).
- J. Klein, “From children’s perspectives: a model of aesthetic processing in theatre,” *J. Aesthetic Education* **39**, 40–57 (2005).
- C. C. Carbon and M. Jakesch, “A model for haptic aesthetic processing and its implications for design,” *Proc. IEEE* **101**, 1–11 (2013).
- H. Leder, B. Belke, A. Oeberst, and D. Augustin, “A model of aesthetic appreciation and aesthetic judgments,” *Br. J. Psychol.* **95**, 489–508 (2004).
- B. Belke, H. Leder, and C. C. Carbon, “When challenging art gets liked: Evidences for a dual preference formation process for fluent and non-fluent portraits,” *PLoS ONE* **10**, e0131796 (2015).
- C. Muth, M. H. Raab, and C. C. Carbon, “The stream of experience when watching artistic movies. Dynamic aesthetic effects revealed by the Continuous Evaluation Procedure (CEP),” *Frontiers Psychology* **6** (2015).
- C. Muth and C. C. Carbon, “The Aesthetic Aha: On the pleasure of having insights into Gestalt,” *Acta Psychologica* **144**, 25–30 (2013).
- C. C. Carbon, “Art perception in the museum: How we spend time and space in art exhibitions,” *i-Perception* **8**, 1–15 (2017).
- P. J. Locher, K. Overbeeke, and S. Wensveen, “Aesthetic interaction: A framework,” *Design Issues* **26**, 70–79 (2010).
- T. Armstrong and B. Detweiler-Bedell, “Beauty as an emotion: The exhilarating prospect of mastering a challenging world,” *Rev. Gen. Psychol.* **12**, 305–329 (2008).
- E. B. Feldman, “Varieties of visual experience,” 4th ed. (Prentice Hall, Upper Saddle River, NJ, 1992).
- M. Pelowski, “Tears and transformation: feeling like crying as an indicator of insightful or “aesthetic” experience with art,” *Frontiers Psychology* **6**, 1006 (2015).
- S. E. Palmer, K. B. Schloss, and J. Sammartino, “Visual aesthetics and human preference,” *Annu. Rev. Psychol.* **64**, 77–107 (2013).
- P. J. Silvia, “Knowledge-based assessment of expertise in the arts: Exploring aesthetic fluency,” *Psychology Aesthetics, Creativity, Arts* **1**, 247–249 (2007).
- S. Vogt and S. Magnussen, “Expertise in pictorial perception: Eye-movement patterns and visual memory in artists and laymen,” *Perception* **36**, 91–100 (2007).
- C. C. Carbon, S. J. Faerber, G. Gerger, M. Forster, and H. Leder, “Innovation is appreciated when we feel safe: On the situational dependence of the appreciation of innovation,” *Int. J. Des.* **7**, 43–51 (2013).
- C. Redies and F. Gross, “Frames as visual links between paintings and the museum environment: an analysis of statistical image properties,” *Frontiers Psychol.* **4** (2013).
- J. C. Chen and L. Y. Lo, “A statistical approach for photo quality assessment,” *J. Internet Technology* **17**, 1249–1257 (2016).
- P. J. Locher, “Contemporary experimental aesthetics: State of the art technology,” *i-Perception* **2**, 697–707 (2011).
- J. Wagemans, “Historical and conceptual background: Gestalt theory,” in *Oxford Handbook of Perceptual Organization*, edited by J. Wagemans (Oxford University Press, Oxford, UK, 2015).
- J. Wagemans, J. Feldman, S. Gepshtein, R. Kimchi, J. R. Pomerantz, P. A. van der Helm, and C. van Leeuwen, “A century of Gestalt Psychology in visual perception: II. Conceptual and theoretical foundations,” *Psychological Bulletin* **138**, 1218–1252 (2012).
- M. Haertel and C. C. Carbon, “Is this a “Fettecke” or just a “greasy corner”? About the capability of laypersons to differentiate between art and non-art via object’s originality,” *i-Perception* **5**, 602–610 (2014).
- A. D. J. Makin, “The gap between aesthetic science and aesthetic experience,” *J. Consciousness Studies* **24**, 184–213 (2016).
- T. D. Parsons, *Clinical Neuropsychology and Technology* (Springer, Heidelberg, 2016).
- C. Muth, M. H. Raab, and C. C. Carbon, “Expecting the unexpected: How gallery-visitors experience Semantic Instability in art,” *Art Perception* **5**, 1–22 (2017).
- C. Muth, V. M. Hesslinger, and C. C. Carbon, “Variants of semantic instability (SeIns) in the arts. A classification study based on experiential reports,” *Psychology Aesthetics, Creativity, Arts* **12** (2018).
- D. Brieber, H. Leder, and M. Nadal, “The experience of art in museums: An attempt to dissociate the role of physical context and genuineness,” *Empirical Studies Arts* **33**, 95–105 (2015).
- L. K. M. Graf and J. R. Landwehr, “A dual-process perspective on fluency-based aesthetics: The pleasure-interest model of aesthetic liking,” *Personality Social Psychology Review* **19**, 395–410 (2015).
- M. Pelowski, P. S. Markey, J. O. Luring, and H. Leder, “Visualizing the impact of art: An update and comparison of current psychological models of art experience,” *Frontiers Human Neuroscience* **10** (2016).
- D. Brieber, M. Nadal, H. Leder, and R. Rosenberg, “Art in time and space: Context modulates the relation between art experience and viewing time,” *PLoS ONE* **9** (2014).
- M. Pelowski, M. Forster, P. P. L. Tinio, M. Scholl, and H. Leder, “Beyond the lab: An examination of key factors influencing interaction with ‘real’ and museum-based art,” *Psychology Aesthetics Creativity Arts* **11**, 245–264 (2017).
- C. Ikard, “*The aesthetic experience, flow, and smart technology: viewing art in a virtual environment*,” Ph.D (Walden University, 2016).
- J. K. Smith and L. F. Smith, “Spending time on art,” *Empirical Studies of the Arts* **19**, 229–236 (2001).
- L. F. Smith, J. K. Smith, and P. P. L. Tinio, “Time spent viewing art and reading labels,” *Psychology Aesthetics Creativity Arts* **11**, 77–85 (2017).
- M. Tröndle, S. Wintzerth, R. Wäspé, and W. Tschacher, “A museum for the twenty-first century: the influence of ‘sociality’ on art reception in museum space,” *Museum Management Curatorship* **27**, 1–26 (2012).
- P. J. Locher, J. K. Smith, and L. F. Smith, “The influence of presentation format and viewer training in the visual arts on the perception of pictorial and aesthetic qualities of paintings,” *Perception* **30**, 449–465 (2001).
- M. Nyström, R. Andersson, K. Holmqvist, and J. van de Weijer, “The influence of calibration method and eye physiology on eyetracking data quality,” *Behavior Research Methods* **45**, 272–288 (2013).

- <sup>46</sup> P. J. Locher and M. Dolese, “A comparison of the perceived pictorial and aesthetic qualities of original paintings and their postcard images,” *Empirical Studies Arts* **22**, 129–142 (2004).”
- <sup>47</sup> S. Wolz and C. C. Carbon, “What’s wrong with an art fake? Cognitive and emotional variables influenced by authenticity status of artworks,” *Leonardo* **47**, 467–473 (2014).
- <sup>48</sup> P. J. Silvia, “Looking past pleasure: Anger, confusion, disgust, pride, surprise, and other unusual aesthetic emotions,” *Psychology Aesthetics, Creativity, Arts* **3**, 48–51 (2009).
- <sup>49</sup> M. D. Augustin, J. Wagemans, and C. C. Carbon, “All is beautiful? Generality versus specificity of word usage in visual aesthetics,” *Acta Psychologica* **139**, 187–201 (2012).
- <sup>50</sup> M. D. Augustin, H. Leder, F. Hutzler, and C. C. Carbon, “Style follows content: On the microgenesis of art perception,” *Acta Psychologica* **128**, 127–138 (2008).
- <sup>51</sup> J. Wagemans, “Towards a new kind of experimental psycho-aesthetics? Reflections on the Parallelepiped project,” *i-Perception* **2**, 648–678 (2011).